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Development and Evaluation of a Pedestrian Safety Training Program for Elementary School Bus Riders

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16. Abstract The objective of this study was to develop and evaluate a comprehensive pedestrian safety program for elementary (kindergarten through grade 6) school bus riders. Existing materials, crash data and state laws/regulations on school bus pedestrian safety were reviewed, and a list of 113 behaviors to be included in the program was developed. The major behavioral categories were: getting ready for school, walking to/from the bus stop, waiting at the bus stop, crossing to the bus, boarding the bus, riding the bus, exiting/crossing from the bus and evacuating the bus. The resultant program contains materials for teachers, parents and bus drivers. They include separate <i>Teacher's Guides</i> for each of the seven grade levels. Incorporated in the program for children are two previously produced NHTSA videos: <i>Stop and Look with Willy Whistle</i> and <i>Walking with Your Eyes</i> and one newly developed video titled <i>Willy Whistle Rides the School Bus</i> . A course poster completes the classroom materials. Parent materials include a video titled <i>School Bus Safety Starts at Home</i> and a brochure titled <i>Reminder to Parents...School Bus Safety Starts at Home</i> . Bus driver materials include a video titled <i>When They're Not on the Bus</i> and a brochure titled <i>They're Pedestrians When They're Not on the Bus</i> . Two promotional pieces (a flyer and an 8-page brochure) were prepared to assist NHTSA in marketing the program. All student materials were evaluated in the East Ramapo Central School District, Spring Valley, New York, using a pre-post design with a comparison site. Statistically significant improvements were achieved in critical knowledge and skills as a result of student participation in the program.			
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- The National School Transportation Association

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I. INTRODUCTION

Children represent a significant proportion of pedestrians killed and injured in traffic crashes. While the actual school bus trip is among the safest forms of transportation, there are nevertheless substantial pedestrian risks associated with the total trip as the child walks to and from the bus stop, waits for the bus in a traffic environment, gets on and off the bus at home and at school, and sometimes crosses the street to and from the bus. On average, 41 children a year are killed in school-bus related traffic crashes, and almost three-quarters of these crash victims are pedestrians (National Center for Statistics and Analysis, undated). Many more are injured.

For many years the National Highway Traffic Safety Administration (NHTSA) has supported the study of pedestrian crashes and the development of measures to counter these crashes. Early and continued emphasis has been given to crashes involving children. This occurred not only because children represent such a large proportion of pedestrian crashes and the loss of a child is so tragic, but also because children can be relatively easily reached with educational approaches through their school systems. To this end, in 1981 NHTSA supported the development of a pilot training program for school bus riders in an attempt to make the pedestrian part of the school bus trip safer. This bus safety program was part of an extensive school curriculum on pedestrian safety known as *Pedsafe* (Dueker and Chiplock, 1981). Designed for the suburban and rural child, the program was not completed in final form appropriate for national distribution as it was produced primarily to support a research program.

The original plan of work for the present study assumed that the previously-developed school bus curriculum (and, in fact, the entire *Pedsafe* program), appropriately updated, revised and expanded, would serve as the basic resource for a new curriculum. Specifically, the intent was to revise the "on-bus" component of the program and add pedestrian safety information from *Pedsafe* and other resources as required to form an updated curriculum in a form which could be distributed nationwide. From an early analysis of the *Pedsafe* package, however, it became apparent that more extensive revisions rather than an update of the previous program was required. This was not the result of deficiencies in *Pedsafe*. Rather, it was warranted by shifts in classroom emphasis and changed requirements for the acceptability of a pedestrian safety program in the 1990s.

The objective of the present study, therefore, was to develop and evaluate a comprehensive pedestrian safety program for the elementary (kindergarten through grade 6) school bus rider that is appropriate to all school environments--urban, suburban and rural. This program was to be complete and ready for duplication and distribution. The study was to consider a comprehensive program including at least the following types of end products:

- Teacher's guides for each grade from kindergarten through grade 6
- A video appropriate for the kindergarten through grade 3 child
- A video and brochure for parents
- A video and brochure for bus drivers

- Materials for use by NHTSA in promoting the program
- One or more posters, e.g., of school bus danger zones.

The study consisted of the following major tasks:

- Definition of course content and scope.
- Development of a detailed school bus pedestrian safety curriculum for each grade level and associated materials such as a video for the kindergarten through grade 3 child and a poster on danger zones around the bus.
- Development of supporting videos and brochures for parents and school bus drivers.
- Recruitment of a school district to cooperate in assessing the program's effectiveness by implementing the school program in the district so that the project could evaluate it.
- Development of materials to assist NHTSA in promoting the resultant program.

This report is organized primarily in the chronological order in which the tasks were performed. It includes the following sections:

- This first section (*Section I*) describes study objectives and approach and explains how the report is organized.
- *Section II* describes curriculum development procedures.
- *Section III* describes the resultant curriculum and all supporting materials.
- *Section IV* describes program evaluation procedures and results.
- *Section V* provides a discussion of the implications of the evaluation results for nationwide use of the curriculum.

Appendices to the report provide a list of the behaviors taught in the course, a summary of non-NHTSA materials reviewed for the study, selected crash data, and procedures and forms used for the collection of behavioral data.

II. CURRICULUM DEVELOPMENT

This section describes the procedures involved in developing the school bus safety curriculum. First, it presents activities involved in defining course content and scope, that is, the behaviors to be addressed by the program. This presentation is followed by a discussion of selected curriculum design considerations including course length, incorporating the program into an existing school curriculum, and curriculum packaging.

A. DEFINITION OF COURSE CONTENT AND SCOPE

The study was initiated with an identification and review of existing materials and data on school bus pedestrian safety. These included educational curricula and videos on school bus and pedestrian safety as well as child pedestrian crash data. The purpose of the review was to assure appropriateness and completeness of course content and scope. In addition, the review served to identify existing NHTSA materials that could be incorporated in the program. In the context of this study, "school bus pedestrian safety" was defined as the entire trip from home to school and back again as long as some part of the trip involved a ride on a school bus. Thus, basic pedestrian behaviors involved in the walk to and from the bus stop were to be included as well as those behaviors associated with boarding and disembarking the bus and riding safely. This is consistent with the School Bus Crash Type as defined in NHTSA's prevailing crash (accident) typology. This type covers pedestrians struck by the bus itself, those hit by vehicles passing a stopped school bus and pedestrian crashes which occur while a child is going to or from a school bus stop.

To provide a standard against which to evaluate the contents and scope of the various materials, a preliminary list of school bus pedestrian safety behaviors considered appropriate for the course was developed. The major behavioral categories included in this list paralleled the adopted definition of "school bus pedestrian safety" and included:

- Getting ready for school
- Walking to/from the bus stop
- Waiting at the bus stop
- Crossing to the bus
- Boarding the bus
- Riding the bus
- Exiting/crossing from the bus
- Evacuating the bus.

Although it was recognized that riding the bus and evacuating the bus were not pedestrian safety behaviors, their inclusion was considered mandatory in order that the resultant program would satisfy existing state laws and administrative rules regarding school bus

training. Their inclusion was also consistent with the "home to school and back" scope adopted for the program from the outset.

As materials were reviewed, the list was revised and expanded as appropriate. The final detailed list included 113 specific behaviors which were deemed appropriate to cover in the program as defined. This list of behaviors is shown in Appendix A.

The materials reviewed and the conclusions reached concerning their applicability to the currently developed program are discussed below under the following topical headings: NHTSA child pedestrian safety materials, other school bus pedestrian safety materials, crash data on child pedestrian accidents and development of course contents and scope. Details of selected analyses are included in the appendices.

1. NHTSA's Child Pedestrian Safety Materials

Existing NHTSA child pedestrian materials were reviewed to determine their adequacy for use in training specific behaviors of the new school bus pedestrian safety program. In addition to the *Pedsafe* program, this review covered the *Walk in Traffic Safety Program* and two videos: *Stop and Look With Willy Whistle* and *Walking With Your Eyes*. Each of these materials is described in the following paragraphs.

Pedsafe and Its "On-Bus" Component: As indicated previously, the original plan for the current study involved expanding and updating of the "on-bus" component of the *Pedsafe* program, with other child pedestrian materials from that program included as appropriate. *Pedsafe* combines general pedestrian safety with school bus safety and was designed for suburban/rural children from kindergarten through grade 12. The "on-bus" component of *Pedsafe* is devoted exclusively to pedestrian behavior around the bus and consists primarily of a 15-minute video shown in the classroom and a 40-minute school bus practice session conducted by the classroom teacher and the school bus driver. Additional 3- to 5-minute on-bus sessions conducted by the school bus driver during normal runs are included.

A brief overview of the major pedestrian topics covered in the basic *Pedsafe* program follows:

- Grades K and 1 cover differentiating left from right, locating the edge of the road, crossing the road midblock with and without parked cars, waiting at the bus stop and crossing to and from the school bus.
- Grade 2 adds walking along the road and crossing at intersections.
- Grade 3 adds estimating time and distance and procedures to follow when a car stops to let the pedestrian cross the street.
- Grade 4 adds cautions in walking along the roadway.

- Grades 5 and 6 summarize information taught in previous lessons.

It is a comprehensive pedestrian safety program with each grade providing review and practice of knowledge and skills taught in previous grades.

Danger zones around the school bus are covered in the *Pedsafe* program but not emphasized. Excluded completely are procedures for getting ready for school, boarding the bus, riding the bus and evacuating the bus. The last two topics are currently considered especially important from the point of view of program acceptability since they are required training in most states--either by statute or administrative rule. A review of the instructional strategies in *Pedsafe* revealed that they are not consistent with current practice. For example, heavy use is made of games and simulations. Although these are considered excellent instructional strategies, the games and simulations are not realistic in many instances and are overemphasized. The video is outdated and in need not only of updating but also a complete rewrite to be consistent with current training needs.

As a result of the analysis of the *Pedsafe* materials, it was determined that it would be more cost effective to develop a completely new school bus pedestrian safety program for the present study than to execute the extensive modifications to *Pedsafe* needed to make it acceptable and fully supportive of the currently defined program objectives. Although *Pedsafe* could not be directly revised, its materials provided an excellent resource for evaluating and updating the list of child pedestrian safety behaviors used as the basis for the newly developed program (see Appendix A).

Walk in Traffic Safely: The *Walk in Traffic Safely* (WITS) materials were originally developed by NHTSA and later redesigned and distributed by the National Association for the Education of Young Children. The program is designed for parents and teachers of preschoolers. It consists of a teacher's guide and two story books--one designed for children less than 3-1/2 years old and the other for children aged 3 to 6 years. The stories introduce the child to the pedestrian and traffic environment (such as the road, sidewalk, curb, types of vehicles, stop signs, driveways, alleys) and teach the child to stop at the curb and look left-right-left for cars before entering the street. Also covered are ways to detect signs that a parked car might move. The program provides a valuable introduction to the traffic environment for the very young child. However, it is directed to a younger child than the elementary school student at whom the new school bus pedestrian safety program is targeted. Program materials, therefore, were not considered likely to substitute for specific topics planned for inclusion in the new program.

Stop and Look With Willy Whistle: Probably one of the most successful of NHTSA's pedestrian programs was the *Willy Whistle* film. Originally developed and produced in the 1970s, *Willy Whistle* has recently been updated as a video and renamed *Stop and Look With Willy Whistle*. Designed for the kindergarten through grade 3 child, the video emphasizes basic stop and search behaviors, including stopping at the curb, looking left-right-left until no cars are coming, and then crossing the street while continuing to search until

safely on the other side. It also points out that, when parked cars are present, the child should make sure the cars are empty and not about to move, then go to the edge of the car and stop and search as before. Training in distinguishing one's right from one's left is included.

It was determined that the *Stop and Look With Willy Whistle* program could adequately support coverage of several of the critical behaviors for the kindergarten through grade 3 child including:

- Crossing the road--midblock
- Crossing the road when there are parked cars
- Knowing left from right.

Moreover, the style and behavioral orientation of *Stop and Look With Willy Whistle* is consistent with the approach considered best for the school bus pedestrian program.

Walking With Your Eyes: *Walking With Your Eyes* is a recent update of another successful NHTSA film called *And Keep on Looking*. The video, oriented toward children in grades 4 through 6, starts with a review of stop and search procedures. It then adds procedures to follow at intersections when there are traffic lights or pedestrian signals and when there are visual screens that block the driver's and pedestrian's view of each other. Included in the discussion of visual screens is a warning to cross the street 10 feet in front of a school bus so that the driver can see the pedestrian and to search at the edge of the bus before attempting to cross the street. The pedestrian is also warned *never* to cross in back of a school bus. The video also covers procedures to follow in parking lots and covers cues that indicate that a parked car might start to move.

It was determined that the *Walking With Your Eyes* program could adequately support coverage of the following program behaviors for the grade 4 through 6 child:

- Review of crossing the road--midblock
- Review of crossing the road when there are parked cars
- Crossing the road--intersection
- Meaning of walk signals
- Crossing the road when there are stopped cars/other visual screens
- Walking in parking lots.

2. Other School Bus Pedestrian Materials

This section describes the reviewed non-NHTSA programs and materials for training elementary school children in school bus pedestrian safety. The materials were obtained as a result of requests from national pupil transportation organizations to their memberships as well as from direct requests from the project staff to selected organizations and individuals.

Materials were received from the following 11 states: Connecticut, Florida, Illinois, Indiana, Iowa, New Hampshire, New York, Oregon, Utah, Virginia, and Washington. The Iowa program is used essentially unchanged by the States of Connecticut and Florida, and the New York program is used essentially unchanged by the State of New Hampshire. Materials were also received directly from national pupil transportation organizations and from selected counties, cities, individuals and private organizations.

Materials included curricula, videos, film strips and accompanying audios, and brochures. Titles of the materials received are listed below along with their source:

- *The ABC's of School Bus Safety* (States of Iowa, Connecticut and Florida)
- *Pupil Transportation Safety* (States of New York and New Hampshire)
- *Pupil Rider Safety* (State of Virginia)
- *School Bus Safety* (Fairfax County, Virginia)
- *The Indiana K-6 Traffic Safety Education Curriculum* (State of Indiana)
- *A Safe Ride to School - A Safe Ride Home* (State of Illinois)
- *The Oregon Pedestrian and School Bus Safety Book* (State of Oregon)
- *A Resource File for Elementary Safety Education in Utah Schools* (State of Utah)
- *My School Bus* (State of Washington)
- *Ready to Ride* (State of Washington)
- *Your Bus and You* (State of Washington)
- *School Bus--The Danger Zone* and *Things That Help Keep You Safe* (State of Washington)
- *School Transportation Awareness and Ridership Training* (National School Transportation Association)
- *School Bus Safety Program* (American Automobile Association)
- *It's Worth a Life* (National Association for Pupil Transportation)
- *Safe Crossing: An "Egg-cellent" Idea* (Quality Safety Services, New York)
- *Look Out* (Allegheny County, Pennsylvania)
- *Bus Safety for Students* (Washoe County, Nevada)
- *Talking Safety Bus* (Digital recorders, Inc.)
- *Urban School Bus Safety* (Milwaukee, Wisconsin)

In view of the number of materials received for study, no attempt will be made here to outline their contents individually. Rather, each is described individually in Appendix B. Included in the appendix is the source (state, county, city, individual, organization) providing the materials, the grade levels for which the materials were developed, the nature of the materials provided, and a brief outline of contents.

All of the materials received were carefully reviewed and the list of behaviors in Appendix A was updated as appropriate. Most of the materials received for study were directed to the portion of the school bus pedestrian trip in which the school bus was present. Thus, they typically covered behavior on and around the bus, including waiting for the bus, crossing to the bus, boarding the bus, riding the bus, and exiting and crossing from the bus. The danger zones around the bus were usually emphasized, and procedures to ensure that the student is always visible to the driver were stressed. Because the requirement to conduct emergency evacuation training is mandated by many states, that topic was also frequently covered in school bus safety programs. Some programs included sections on going to/from the bus. These provided an opportunity to address other accident types such as those that occur while walking along the road as well as midblock and intersection crashes that occur while crossing the street in the absence of a school bus. However, this coverage was typically not extensive. Some programs included separate sections on pedestrian and other types of safety (for example, bicycle and motor vehicle safety). One program was concerned with pedestrian safety only, but it was not oriented toward specific crash types.

3. Crash Data on Child Pedestrian Crashes

The work effort included a review and analysis of recent child pedestrian crash data to assure that all appropriate types of pedestrian crashes were included in the program. Again, this analysis was initiated with a review of the accident types included in *Pedsafe*. Recent data (1990) from NHTSA's Fatal Accident Reporting System (FARS) and General Estimates System (GES) served as primary sources for determining whether accident types were current. Data were also obtained from the Kansas Department of Transportation for the years 1974 to 1988 and from selected states. A summary of the information obtained is included in the following paragraphs. Selected details are included in Appendix C.

Based on an evaluation of suburban/rural pedestrian crash types, the developers of *Pedsafe* determined that the following crash types could be best countered by an in-school training approach and, in combination, would result in a training program having the greatest impact on crash reduction:[†]

[†]A detailed discussion of the NHTSA pedestrian crash typology is beyond the scope of this report. The interested reader is referred to Knoblauch (1977) and Snyder and Knoblauch (1971) which discuss the development and structure of the crash types.

- Midblock dart-outs and dashes where the driver doesn't see the child or the child is running.
- Intersection dashes.
- Walking along the roadway.
- School-bus related where the child is going to or from a school bus or school bus stop.
- Multiple threat where a driver has stopped to let a child cross and the child is screened from view of oncoming traffic by the stopped car.

Pedsafe includes training in all of these crash types.

The most recent FARS report (1990) available to this study at the time crash analyses were underway did not present pedestrian accident data by accident type. It did, however, list the location of fatal crashes by age group. It showed that approximately four out of five fatal accidents occurring to five- to 15-year old children took place midblock; only about one out of five occurred at an intersection. The preponderance of midblock fatal accidents indicates a need to provide early training to counter these crashes. In these crashes, the child typically appears in the road so suddenly that a driver does not have time to react to avoid an impact. Previous research (c.f., Blomberg and Preusser, 1974; Blomberg, Preusser, Hale, and Leaf, 1983) clearly showed that children need to learn to stop and look left-right-left for traffic before entering the street, and this training must be started at an early age.

The most recent GES (1990) report available for study also provided estimates of crash location by age group. It showed that, for children aged nine and under, about four out of five accidents were estimated to occur midblock. For 10- to 14-year old children, about 2/3 of the accidents were estimated to occur midblock. Again, these data emphasize the need for early training to counter midblock crashes.

Since crash types were not provided in the 1990 GES report but are contained in the GES data base, a request was made to NHTSA's National Center for Statistics and Analysis (NCSA) to provide an analysis of GES data by type code for ages five through 11 (ages of elementary school children to whom the training provided by the current study is directed). These data were obtained for 1990 and 1991. The five largest crash type code categories for both years are the same, but not precisely in the same rank order. The percent of crashes and rank order for each type are:

	<u>1990</u>		<u>1991</u>	
	<u>%</u>	<u>Rank</u>	<u>%</u>	<u>Rank</u>
Midblock dash	18.01	1	29.75	1
Intersection--other	16.46	2	20.55	2
Midblock dart-out	11.12	3	5.29	5
Midblock--other	10.95	4	14.38	3
Intersection dash	9.13	5	6.46	4

These crashes account for 65.67% and 76.43% of the total accidents for 1990 and 1991, respectively. The data show that darts and dashes, both midblock and at intersections, account for the largest group of children's crashes.

Analysis of the GES data by the crash types covered in the *Pedsafe* program revealed the following data:

	<u>Percent of accidents</u>	
	<u>1990</u>	<u>1991</u>
Midblock dart-outs and dashes	32.22%	36.58%
Intersection dash	9.13	6.46
Walking along roadway	0.49	0.28
School-bus related	2.78	4.63
Multiple threat	4.31	0.71

The data for midblock dart-outs and dashes are slightly larger than the simple sum of the numbers presented in the previous listing since *Pedsafe* included a few additional crash types (such as ice cream vendor and mailbox related) in its midblock dart and dash category. However, it was apparent from the analysis of FARS and GES data that there was no reason to add to or delete crash types addressed in the *Pedsafe* program.

Some states provided crash data as well as other materials for study use. When provided, these data consisted largely of counts of school bus crashes (including those involving fatalities, personal injuries and property damage). As might be expected, no data were provided with associated crash types according to the NHTSA typology. However, some interesting national and local statistics were obtained. National data are provided below. Local data are included in Appendix C.

National statistics for the years 1974 through 1988 were obtained from the June 1990 issue of *National School Bus Report* (Kansas Department of Transportation, 1990). In all, there were 577 fatal accidents to school children during that period. The fatalities occurred as follows:

Percent of fatalities

School children killed at front of bus	43.7%
School children killed at back of bus	18.4
School children killed by passing vehicle	33.3
No information	4.7

Thus, about two-thirds of the children who were *killed* in school bus accidents were struck by the bus itself. This occurs when a child lingers near the front, sides or rear of the bus and is struck because the driver doesn't see the child. Most commonly, the child has left a conventional bus (with a long hood) and crosses directly in front of the bus. The hood prevents the driver from seeing the child. Although this problem has been addressed in some locales by the installation of crossover arms which swing out in front of the bus to force children to stay out of the danger zone, the arms are by no means universally employed. Children also sometimes linger near the rear of the bus and are swept under the rear wheels when the bus starts to move. These data emphasize the importance of training all children to stay out of the danger zones around the school bus.

The data also show that about one-third of the victims are struck by a passing vehicle. This crash typically involves an illegal act on the part of the striking motorist. The laws of all states require a motorist to stop and stay stopped for a school bus displaying its flashing lights. In most crashes of this type, the motorist simply ignores the lights, often claiming that they were not seen. Typically, the vehicle passes the school bus on the left, although in some instances the driver attempts to pass the vehicle on the right. This is more likely to occur if the bus has stopped far from the curb or side of the road. Thus, children should be taught to look right before exiting the bus as well as to stop at the edge of the bus and look left-right-left for traffic before trying to cross the street. School bus drivers should be urged to stop as close to the right edge of the road as possible to preclude the possibility of motorists attempting to sneak by the bus on the right.

As might be expected, most (89.9%) of these crashes occurred during daylight since most children travel to and from school in the daylight hours. The children were involved in the following activities:

Percent of fatalities

Going to school	25.0%
On an activity trip	.5
Coming home from school	71.8
No information	2.8

The data compiled by the Kansas Department of Transportation show that most (71.8%) of the crashes occurred when the children were coming home from school. The children are likely excited that their school day is over, are looking forward to play activities and simply

become careless. It is interesting to note the small number of fatalities that occurred on activity trips. This may simply be a result of very low exposure on these trips or a consequence of the increased regimentation and supervision which is typically present on activity trips.

The areas in which fatalities occurred were are follows:

	<u>Percent of fatalities</u>
Loading/unloading area	29.8%
School grounds	3.6
Road, street, highway	64.2
Other/no information	.4

These data show that fatal crashes occur on the roadway or in loading/unloading areas. Very few fatalities occur on school grounds where there is increased supervision and buses only move at very slow speeds.

The project also was able to analyze samples of non-fatal crash data from several school districts with whom staff members have worked. These data tended to confirm the findings from FARS, GES and the Kansas Department of Transportation. In summary, the analysis of crash data indicated that the *Pedsafe* program's coverage of *crash types* was adequate and a good basis for the design of the present curriculum. Midblock crashes appear to predominate in the age group under study and therefore require early and continued emphasis in the curriculum. Fatal crashes occur primarily in loading/unloading areas and in roads, streets and highways. It is interesting to note that they, as well as non-fatal pedestrian crashes to youth (c.f., Blomberg and Preusser, 1974) occur primarily when the student is returning home from school. The large number of fatalities to students in early grades (kindergarten through third grade) emphasizes the need for early school bus pedestrian safety training.

Overall, it was the unmistakable conclusion from the crash data that children require training covering the entire trip from home to school and back again with special emphasis on staying out of the danger zones and proper street crossing procedures.

4. Development of Course Content and Scope

The result of the analyses described above was a final list of behaviors that defined the content and scope of the program. This list is presented in Appendix A. The comprehensiveness of the behaviors in the list suggests that any training package based on it can help a child successfully complete the entire home-to-school-to-home trip each day. Children will be taught to be ready for the trip before they leave home--as examples, to leave on time, to have all their belongings in backpacks or school bags, and to be dressed appropriately for both weather and visibility. They will be taught all behaviors required of

them to make the *complete* trip safely, including behavior expected both inside *and* outside the school bus itself. And, of course, they will be taught what to do in the event of an emergency.

The analyses also resulted in a decision to include the two existing NHTSA videos as part of the program. One is *Stop and Look with Willy Whistle* for the kindergarten through grade 3 child. The second is *Walking with Your Eyes* for the grade 4 through 6 child. Simply, these videos already address many of the behaviors on the target list. These videos have also been thoroughly researched and evaluated to demonstrate their effectiveness.

B. SELECTED COURSE DESIGN CONSIDERATIONS

As the curriculum behaviors for the course were being established, consideration was also given to selected factors affecting the ultimate design of the course. These included establishing a reasonable length for the program, determining how the program would best fit into an existing school curriculum, and determining how the final product should be packaged.

It was considered desirable, of course, to design a course that was long enough to include *all* behaviors identified for the program. However, it was also considered especially important that the course not be so long that it be considered inappropriate as a school activity. Therefore, an informal survey of educators in four states was conducted. These educators were asked what place a school bus pedestrian safety program should have in their curriculum and what length would be practical and appropriate for the program. They responded that the program should not be an "extra" or "add-on" activity; rather, it should be incorporated into a school's regular teaching curriculum. The time considered appropriate by the educators ranged from four to six hours.

In addition, an informal survey was made of 35 elementary school teachers. They were asked to indicate the length of lessons they would need to cover various school bus pedestrian safety topics *fully* with their students. Suggested times ranged from 15 minutes per topic to as much as a week of school bus pedestrian safety training (to be conducted in the fall when children return to school) with additional activities scheduled throughout the year, as needed, to reinforce the information and skills learned. The teachers were also asked to indicate the curriculum areas in which the school bus pedestrian safety topics could best be integrated. They recommended: health and safety, language arts, social studies, science and math.

Finally, consideration was given to product packaging. Two methods of packaging were considered: packaging by individual grade and packaging by grade groupings. Packaging by grade permits each teacher to have an individual package appropriate to the level of the particular class. However, since the same behaviors are taught from year to year, there

would be a great deal of redundancy in each package. Packaging by multi-grade eliminates much of the redundancy.

Most elementary school systems are currently divided into two groups: kindergarten through grade 3 and grades 4 through 6. However, the trend in education is to organize schools into two groups that include kindergarten through grade 4 as one group and grades five through eight as the other. Thus, selecting a grouping that would satisfy *both current* and *future* school grade organizations was not possible at this time.

On the basis of the surveys and discussions with educators, teachers and the project's curriculum development consultants, it was concluded that the course should be targeted to be completed in a time frame of four hours or less, with individual lessons (including evaluation of student knowledge and skills) designed to be completed within one-half hour. In fact, the final course was designed to be completed in approximately three and one-half hours.

It was also decided that each lesson should have additional activities so that the teacher could extend the lesson time as needed, could give homework assignments, or could use selected activities for refresher training spread throughout the school year. It was also determined that the curriculum should be integrated with the normal classroom flow and provide activities that can easily be incorporated into the school's teaching program for each grade. With regard to packaging, it was concluded that the program should be packaged by individual grade.

III. THE SCHOOL BUS PEDESTRIAN SAFETY PROGRAM

A. COURSE LESSONS

The course content was organized into seven lessons, each of which requires approximately one-half hour for completion. Additional activities are included with each lesson so that training on each topic can be extended at the option of the teacher. The seven lessons are listed in Table 1.

Table 1. Course Lessons

<p>Lesson 1: <i>The Danger Zones</i>--areas around the school bus where the driver and child can't see each other.</p> <p>Lesson 2: <i>Walking Near and Evacuating the Bus</i>--a bus drill that includes review of the danger zones plus emergency evacuation procedures.</p> <p>Lesson 3: <i>Crossing the Street</i>--for young children, crossing the street midblock with and without parked cars and, for older children, procedures to follow at intersections and procedures to follow in parking lots.</p> <p>Lesson 4: <i>Walking to the Bus Stop</i>--getting ready for school and walking to the bus stop.</p> <p>Lesson 5: <i>Arrival of the Bus</i>--waiting at the bus stop, the meaning of the bus signal lights, and boarding the bus.</p> <p>Lesson 6: <i>Riding the Bus</i>--safe bus riding procedures.</p> <p>Lesson 7: <i>Crossing to and from the Bus</i>--crossing the street to the bus, leaving the bus, and crossing the street from the bus.</p>
--

The scope of each course lesson by grade is shown in Table 2. Videos that are included in the program are also shown in the table. Program coverage for school-bus topics is virtually identical for all seven grades since repetition of these critical skills is considered important for the elementary school child. Grades 4 through 6 receive advanced training primarily in basic pedestrian activities.

Table 2. Course Scope by Grade

Topic	K	1	2	3	4	5	6
1. The Danger Zones	x	x	x	x	x	x	x
2. Walking Near and Evacuating the Bus							
Walking near the bus	x	x	x	x	x	x	x
Evacuating the bus	x	x	x	x	x	x	x
Emergencies requiring evacuation	x	x	x	x	x	x	x
Rules to follow in emergencies	x	x	x	x	x	x	x
Location of bus emergency exits	x	x	x	x	x	x	x
How to open emergency exits	x	x	x	x	x	x	x
Procedures for making an emergency exit	x	x	x	x	x	x	x
Location and use of emergency equipment	x	x	x	x	x	x	x
Procedures when the driver is incapacitated	x	x	x	x	x	x	x
3. Crossing the Street							
Video-- <i>Stop and Look With Willy Whistle</i>	x	x	x	x			
Knowing left from right	x	x					
Locating the edge of the road	x	x					
Crossing with and without parked cars	x	x	x	x			
Video-- <i>Walking With Your Eyes</i>					x	x	x
Crossing midblock with and without parked cars					x	x	x
Visual screens					x	x	x
Green lights/Walk signals/crosswalks don't mean safe					x	x	x
Meaning of flashing Don't Walk signal					x	x	x
Turning vehicles					x	x	x
Parking lots					x	x	x
4. Walking to the Bus Stop							
Backpack/appropriate clothing/timely arrival	x	x	x	x	x	x	x
General rules	x	x	x	x	x	x	x
Walking along the road	x	x	x	x	x	x	x
Driveways and alleys	x	x	x	x	x	x	x
Wide, curvy, hilly roads; roads without shoulders					x	x	x
5. Arrival of the Bus							
Rules for waiting	x	x	x	x	x	x	x
Cautions when weather is bad	x	x	x	x	x	x	x
School bus lights and arms	x	x	x	x	x	x	x
Boarding the bus	x	x	x	x	x	x	x
6. Riding the Bus							
Video-- <i>Willy Whistle Rides the School Bus*</i>	x	x	x	x			
Discussion--riding the bus	x	x	x	x	x	x	x
7. Crossing to/from the Bus							
Crossing to the bus	x	x	x	x	x	x	x
Exiting the bus	x	x	x	x	x	x	x
Crossing from the bus	x	x	x	x	x	x	x

*For the first year of program implementation, the video could also be shown to grades 4-6.

It should be noted that the second lesson (*Walking Near and Evacuating the Bus*) is designed as a bus drill conducted with an actual school bus. However, the lesson plans include procedures for conducting the lesson in the classroom in the event that a bus is not available.

Tables 1 and 2 also indicate the recommended sequence for the course lessons. The following logic was used in determining the order of the lessons:

- Information on the danger zones should be presented first since knowledge of these zones is critical to safe behavior around school buses and is therefore needed as early in the school year as possible.
- A bus drill should be the second lesson to satisfy the many state laws and administrative rules that specify that such a drill be conducted early in each school year. Presenting this lesson second rather than first provides an opportunity for the teacher to conduct a review of the danger zones in the presence of an actual school bus.
- Street crossing procedures should be presented next since they are basic to all pedestrian activities and critical to school bus pedestrian safety. Training in these procedures should precede other pedestrian safety training.
- The above lessons should be followed by school bus specific lessons covering the trip from home to school in a logical order, that is, walking to the bus stop, waiting for and boarding the bus, and riding the bus to school.
- Finally, the last lesson should provide practice in crossing the street to the school bus, exiting the bus, and crossing the street from the bus.

It is recommended that the course be given early in the fall term and that at least one lesson be presented per week. As indicated previously, each lesson has been designed to require approximately one-half hour. Since follow-up activities are included, the teacher can extend the time devoted to each topic or can schedule additional lessons depending on the needs of the particular class. The teacher can also use selected activities for homework assignments or in review sessions scheduled throughout the school year.

B. DESIGN OF THE *TEACHER'S GUIDES*

There is a separate *Teacher's Guide* for each grade from kindergarten through grade 6. An introductory section describes the curriculum and its contents and provides suggestions for preparing to teach the lessons. A separate lesson plan is then provided for each lesson. Each lesson plan contains the sections listed in Table 3. All print materials required to teach a lesson are included with that lesson.

Table 3. Contents of Each Lesson Plan

<i>Goal:</i>	The teacher's objective for the lesson.
<i>Objectives:</i>	The students' objectives for the lesson.
<i>Equipment Requirements:</i>	Requirements for school buses and audiovisual equipment. (This section is omitted if there are no equipment requirements.)
<i>Materials:</i>	Materials required to teach any part of the lesson (including extension/follow-up activities) or provided as a teacher resource.
<i>Procedures:</i>	Detailed procedures to follow in conducting the lesson. These procedures (including student evaluation) have been designed to be completed in approximately 1/2 hour.
<i>Extension/ follow-up activities:</i>	Activities that can be used to extend the lesson if more time is available for the topic, if more time is needed for the topic, or if the teacher wishes to make homework assignments. This allows each lesson to be extended to meet the needs of a particular class.
<i>Evaluation:</i>	Procedures for assessing attainment of student objectives.
<i>Appended materials:</i>	Black-line masters of all print materials required to teach the lesson or included as resource material for the teacher. Included are illustrations, school bus safety rules, stories (for kindergarten through grade 3 children), and student activity sheets.

The program teaching techniques emphasize active student participation in the learning process. Classroom practice of behavioral skills is included for all grades wherever possible and practical. In addition, students are actively involved in question and answer sessions and in group discussions. For the kindergarten through grade three child, stories are used to teach the principles of getting ready for school, walking to the bus stop, waiting at the bus stop and boarding the bus. Although their activities are similar, there is a different child in the stories for each grade level. These same characters appear in the video developed for

the kindergarten through grade 3 child. For the grade 4 through 6 child, there is an integrated curriculum that adds learning through writing and solving math problems. In addition, use is made of cooperative learning whenever possible.

C. COURSE VIDEOS

Three videos are incorporated in the classroom part of the curriculum. Two are the previously-developed NHTSA pedestrian safety videos that were described in Section II (*Stop and Look With Willy Whistle* and *Walking With Your Eyes*). Both are included in the third lesson (*Crossing the Street*)--one for the students in kindergarten through grade 3 and one for students in grades 4 through 6. An additional video (*Willy Whistle Rides the School Bus*) was developed specifically for this program. It was designed for the kindergarten through grade 3 student and is included in the sixth lesson (*Riding the Bus*). A brief description of these videos follows.

- ***Stop and Look With Willy Whistle***--Designed for children in kindergarten through third grade, it emphasizes basic stop and search procedures, including stopping at the curb, looking left-right-left until no cars are coming, and crossing the street while continuing to search until safely on the other side. Procedures to follow when there are parked cars present are also included.
- ***Walking With Your Eyes***--Designed for children in grades 4 through 6, it reviews basic stop and search procedures and adds procedures to follow at intersections when there are traffic lights and pedestrian signals and when there are visual screens that block the pedestrian's and driver's views of each other. It also covers procedures to follow in parking lots.
- ***Willy Whistle Rides the School Bus***--This video was developed specifically for this curriculum and was designed to coordinate with the kindergarten through grade 3 lesson plans prepared for the program. These lesson plans contain stories about four children--one for each grade level. Selected contents of these stories are repeated in the video. The video is scheduled to be shown late in the training program so that students will have an opportunity to "meet" the particular child representing their grade level before the video is shown. In addition, since the video summarizes information presented in the lesson plans, scheduling the video late in the program permits review and reinforcement of information covered in earlier lessons.

In addition to presenting complementary information in support of the behavioral objectives of the curriculum, the three classroom videos are also coordinated by the use of the same spokespeople (Officer Jim Miller and his "sidekick," the animated character *Willy*

Whistle) and a similar production style. The use of combined animation and live action in which the children and adults interact with *Willy Whistle* adds entertainment value and provides a context for the use of "video magic" to emphasize major safety points.

During the first year of program implementation, the school bus video prepared for kindergarten through grade 3 students could also be shown to children in grades 4 through 6 at the teacher's option as a partial replacement for the absence of training exposure in the early grades. For the older grades, the video could be scheduled at the convenience of the teacher.

D. COURSE POSTER

Willy Whistle appears again in the course poster to explain the danger zones around the school bus. The poster was designed to be introduced in Lesson 1. It also appears as an 8½" x 11" sheet in the appended resource material for Lesson 1. The poster can be mounted in the classroom during Lesson 1 or throughout the entire school bus pedestrian safety program. The resource sheet can be copied and distributed to all the children.

E. MATERIALS FOR PARENTS AND BUS DRIVERS

It is considered important that parents be included in this program because they establish behavioral patterns in their children which can support or be detrimental to the training objectives. To this end, the program package provides supporting materials prepared specifically for parents. Included are a video titled *School Bus Safety Starts at Home* and a brochure titled *A Reminder to Parents...School Bus Safety Starts at Home*. The video describes the school bus pedestrian safety training being provided to the children in school and suggests ways that parents can help to make their children safer pedestrians and safer school bus riders. The suggestions are repeated in the brochure. The video could be shown at PTA meetings, parents' nights, and other school meetings where parents are present. A copy of the brochure could be sent home with each child.

The program also includes materials prepared for the school bus driver because the driver is typically the only adult present at the time and place when the critical safety behaviors must be performed by the students. By including the bus driver, it is hoped that correct execution of the desired behaviors will be praised and reinforced and incorrect performance will be highlighted and corrected. Driver materials include a video titled *When They're Not on the Bus* and a brochure titled *They're Pedestrians When They're Not on the Bus*. Again, the video explains what the children are being taught about school bus pedestrian safety and suggests ways that drivers can help ensure the pedestrian safety of their passengers. The video could be included in the routine school bus driver training provided in the district, and each driver could be provided with a copy of the brochure.

Each brochure consists of two 8½" x 11" black-line sheets that can be reproduced back-to-back and folded as desired. Space at the end of each brochure permits customizing of the materials for the particular school or school district. The videos also employ Officer Miller and *Willy Whistle* as spokespeople to help the on-screen characters (a teacher in the parents' video and school bus supervisors in the bus driver video) deliver the instructional material.

F. PROMOTIONAL MATERIALS

Two brochures were prepared to assist NHTSA in promoting the school bus pedestrian safety package. One is an 8½" x 11" flyer that briefly presents the problem and recommends the program as a solution. The school bus risks are presented and the lessons that are designed to counter those risks are described. An overview is given of all program components. The second brochure consists of two 11" x 17" pages that describe the program in more detail.

IV. PROGRAM EVALUATION

A. EVALUATION OBJECTIVES

The study plan called for an evaluation of the developed curriculum as implemented in a cooperating school district. The goals of this evaluation were to provide feedback for program improvement and information which could be used to assess effectiveness. The derivation of specific objectives for this evaluation, however, presented somewhat of a dilemma for several reasons. First, although crash reduction is the ultimate objective of the curriculum, it was clear that crashes were too infrequent in any single school district to form the basis for an evaluation. Second, the available assessment time as determined by the duration of the research contract would only permit evaluation during a single school year's implementation. This obviously would not let the program reach its full potential as it is specifically designed to build from year-to-year. Third, although the program timing is flexible at the discretion of the individual teacher, data collection needs would clearly require completion of all modules by the time any post-treatment measures were scheduled.

The evaluation design discussed below overcame some of these problems. Behavior and knowledge measures were used as surrogates for crashes. Agreements were obtained from the cooperating teachers to complete their units by the time follow-up data collection had to be scheduled. Design elements could not, however, compensate for the fact that only a single year in a seven year cycle was actually implemented. Therefore, it was decided that the evaluation could not have as its objective the assessment of the *degree* of change imparted by the program on any of the developed behavior and knowledge measures. Rather, the specific objectives were to determine *if* change occurred and whether the change was in the desired direction. No inference related to the *extent* of the effectiveness of the curriculum can or should be made from the results which follow. They do, nevertheless, provide clear evidence that the program produced changes in the predicted direction and will likely be effective if implemented long-term as designed.

B. SITE SELECTION

Early in the study effort, it was determined that the success of the evaluation task would hinge on the selection of a suitable test site. In addition to providing the basis for a fair test of the developed training program, the selected school system had to be sufficiently representative to permit generalization of study results to other locales in the United States. It was therefore considered desirable to select a school district that was both large and diverse in terms of student population, nature of the community (urban, suburban, rural) and type of pupil transportation system (contract, district-run). It was also considered desirable to select a district exhibiting strong support for its pupil transportation safety system and one which would wholeheartedly support the concept of the program being tested.

As with most decisions in field evaluations, site selection represented a series of trade-offs. For example, selecting a school district with a keen interest in school bus safety inherently limits the amount of improvement which the curriculum can produce. Simply, it was reasoned that a good existing safety program would be associated with relatively good baseline behavior and correct knowledge among the student population. This leaves less room for improvement than in a district with less of a concentration on pupil transportation. On the other hand, it was considered problematic to achieve the extent of cooperation required and the appropriate level of course presentation in a district which did not emphasize pupil transportation safety. Overall, it was decided that it was of primary importance to select a district which would eagerly and realistically implement the program. This would ensure maximum feedback on the process of delivering the curriculum which was of the greatest importance for program improvement.

The East Ramapo Central School District (Rockland County, New York) has a history of supporting improvements in pupil transportation safety. It is a multicultural community in which over 17,000 students are transported to more than 125 public and private schools. The southern part of the district in Spring Valley, New York, is primarily urban. As the district unfolds northward, it becomes increasingly suburban and then extremely rural. Both contract and district-run buses operate in the district.

In early contacts with the Assistant Superintendent for Curriculum, strong support was expressed for conducting a pilot test and evaluation of the program in the East Ramapo school system. Support was also received from the Assistant Superintendent for Business Administration and the Supervisor of Pupil Transportation who agreed to provide all necessary buses and drivers for the conduct of the program bus drills as well as for any required evaluations of student behaviors around school buses. This level of interest and support expressed by the school administrators and transportation officials was exactly what had been considered crucial to successful implementation of the pilot test when establishing the site selection criteria. An agreement was therefore reached with school officials to test the program in the East Ramapo Central School District in the fall of 1993.

C. EVALUATION DESIGN

The study design preferred by NHTSA and selected for the evaluation was pre-post with a comparison site. Two sets of East Ramapo "sister" schools were chosen as treatment schools. Each set of "sister" schools consisted of one school for kindergarten through grade 3 and one for grades 4 through 6. The "sister" school concept is one which East Ramapo uses to retain the cohesiveness of an elementary school (K-6) while still operating from separate buildings. One set of "sister" schools was chosen as the comparison. In total, therefore, four treatment and two comparison schools were chosen to participate in the program test. At each school, two classes at each grade level were randomly selected to participate in the pre-test evaluation and two were selected to participate in the post-test

evaluation. Special education classes were eliminated from the evaluation plan since there were not sufficient numbers of classes or students to make meaningful comparisons.

Pre-test data on knowledge, staged behaviors and naturally-occurring behaviors (see below) were collected at all schools in the month prior to initiation of the program. Following the collection of pre-test data, sufficient copies of all program materials were delivered to the treatment school principals. It had originally been planned to collect post-test data within one month following completion of the program in order to meet the schedule of this project. However, severe winter storms during the planned evaluation period resulted in an inordinately high number of days in which schools were either closed or had delayed openings and could not accommodate program evaluation activities. Therefore, only the knowledge test at one school could be completed during the first month following delivery of the program. Most other post-test data were collected from two to three months following presentation of the program. One skill test was conducted in the fourth month following program presentation.

D. SELECTION OF EVALUATION COMPONENTS

The purpose of the study was to develop and test a set of educational materials designed to reduce school-bus related pedestrian crashes. Since school bus accidents are rare events, it was initially decided to focus the evaluation on behavioral measures presumed to be related to crash generation. Thus, student behavior that serves to reduce or eliminate crashes would serve as a surrogate for the crashes themselves.

There were a large number of behaviors covered by the curriculum as shown in Appendix A. Clearly, some delimitation was required to define a manageable subset of these behaviors for evaluation. As part of the process of identifying behaviors to be covered by the evaluation, it was reasoned that those behaviors which have already been well evaluated or universally accepted and taught in the pedestrian safety field did not require reevaluation. Therefore, an analysis was made of the evaluation status of *all* behaviors included in the school bus pedestrian safety program developed for this study to determine which still required empirical validation. From this analysis, the only pedestrian behaviors that were found to be *neither* tested nor universally accepted were the following:

- Waiting for *all* cars to stop in a multiple threat situation[†] (a behavior taught to students in grades 4 through 6 only).

[†]The multiple threat crash type involves a pedestrian crossing in front of one vehicle which stops or yields for the pedestrian and being struck by an overtaking vehicle whose driver is screened from the pedestrian by the first vehicle.

- Looking to the *right* as the child leaves the bus to check for cars attempting to sneak by on the right.

In addition, although universally accepted, the following behavior had not been explicitly tested:

- Treating a driveway like a roadway.

These three behaviors were not central to the program, nor did they form the basis for a meaningful behavioral evaluation of the ability of the curriculum to influence crash occurrence. The first was simply a conservative variant of the "looking for cars overtaking stopped cars" behavior which has already been tested. The third was simply an extension of basic pedestrian roadway crossing procedures to a roadway-like situation. Only the second of the above-listed behaviors, therefore, appeared to warrant behavioral evaluation, and that did not appear to warrant an evaluation by itself.

Since most of the behaviors covered by the curriculum had either already been tested or were universally accepted, it was decided that the behavioral component of the evaluation should focus on pedestrian safety behaviors around the school bus itself, specifically those behaviors involved in waiting for the bus, boarding the bus and crossing the street to and from the bus. Such an analysis would permit sampling of a fairly large set of behaviors critical to school bus safety. It was also consistent with the importance placed in the curriculum on teaching children how to cope with the danger zones around the bus.

It was also determined that a meaningful evaluation should focus on knowledge gains, particularly those that could be compared with other previously conducted NHTSA research. In addition, of course, it was determined that process data on the program and its materials should be obtained from teachers in the treatment schools.

The final evaluation plan, therefore, provided for collection of the following types of information:

- Knowledge of basic procedures for crossing the street, walking in the street, waiting for the bus, boarding the bus, and exiting and crossing the street from the bus--data to be obtained from the conduct of individual, one-on-one interviews with students.
- Behaviors involved in exiting the bus and crossing the street--data to be obtained from observations of behavior in a staged situation.
- Behaviors involved in waiting for, crossing the street and boarding the bus--data to be obtained from observations of behavior collected during actual school bus operations.

- Design of the program and its materials--data to be obtained from classroom teachers through the use of rating forms and discussion groups.

The analysis performed for each of these evaluation components and the results obtained are described in the following paragraphs. For all frequency data, percentages are presented and a Chi-square statistic was calculated. For simplicity of presentation, grade groupings are referred to as K-3 and 4-6. In the tables and listings which follow, a statistically significant difference between the pre- and post-test measures is indicated by one or more asterisks (*) next to the results and an associated listing of the probability level of the test. The curriculum was considered effective if there was a shift in the desired direction from pre to post which reached at least the 0.05 level of significance.

E. KNOWLEDGE EVALUATION

A questionnaire was developed to measure child understanding of the following school bus pedestrian safety topics:

- Safe procedures to follow *before* crossing the street
- Safe procedures when walking in the street
- Safe waiting distance at the bus stop
- When it is safe to board the bus
- Safe procedures for exiting the bus and crossing the street

The questionnaire consisted of five questions; it is shown in Figure 1.

Trained interviewers (substitute teachers from the East Ramapo Central School District) conducted the interviews. Children were removed from the classroom one at a time, interviewed individually and then returned to the classroom. In all, 1,769 children were interviewed as follows:

	<u>Pre-Test</u>	<u>Post-Test</u>	<u>Total</u>
K-3: Treatment students	325	337	662
Comparison students	166	164	330
4-6: Treatment students	267	259	526
Comparison students	<u>128</u>	<u>123</u>	<u>251</u>
Total	886	883	1,769

The results obtained for each of the five questions included in the knowledge evaluation questionnaire are described in the following paragraphs.

Interviewer _____

School _____

Date _____

Teacher _____

Grade K 1 2 3 4 5 6 LD SE

SCHOOL BUS PEDESTRIAN SAFETY

1. Make believe you're on a sidewalk with no parked cars near you and you want to cross the street. There is no one around to help you cross. To be safe, what should you do before crossing the street?

- Go to corner
- Stop at curb
- Wait for light
- Look for cars (Ask to show how)
- Nothing
- Don't know
- Other _____

How to look for cars

- Look L
- Look R
- Look R-L
- Look L-R
- Look L-R-L
- Look R-L-R

2. Make believe you're walking to the bus stop. There is no sidewalk and you must walk in the street. To be safe, what should you do when you must walk in the street?

- Walk near edge of road
- Walk single file
- Walk facing traffic

- Don't know
- Other _____

3. Make believe you are waiting at the bus stop. To be safe, how far should you stand from the road?

- 6 feet
- 3 giant steps
- More than 6 feet or 3 giant steps

- Less than 6 feet or 3 giant steps
- Don't know
- Other _____

4. Make believe you are waiting at the bus stop, and the school bus has just arrived. How do you know when it's safe to board the bus?

- The driver opens the door
- The driver signals

- Don't know
- Other _____

5. Make believe you're on the bus and it has just stopped at your bus stop. When you leave the bus, you must cross the street to get home. Tell me what you should do to get from your seat off the bus and across the street safely to your home.

- Walk to front of bus
- Hold handrail while exiting
- Check to right before exiting
- Move _____ feet away from bus
- Move _____ feet forward of bus
- Wait for driver's signal

- Stop at edge of bus
- Look for cars
- Cross street looking L and R
- Cross street staying _____ feet in front of bus
- Other _____

Figure 1. School bus pedestrian safety knowledge test.

Question 1: *Make believe you're on a sidewalk with no parked cars near you and you want to cross the street. There is no one around to help you cross. To be safe, what should you do before crossing the street?*

This question dealt with street crossing behavior when there are no parked cars present. To be correct, the children should have mentioned "stop at the curb" and "look for cars." Multiple responses were coded although few multiple responses were received.

The percentages of children in the various evaluation groups who mentioned "stop at the curb" were as follows:

<u>Response</u>	<u>Evaluation group</u>	<u>Pre-Test</u>	<u>Post-Test</u>
Stop at the curb	K-3: Treatment***	0.3%	5.0%
	Comparison	1.2%	1.2%
	4-6: Treatment**	1.1%	5.4%
	Comparison	0.8%	0.8%

** Chi-square significant at .01 level

*** Chi-square significant at .001 level

These data show a small but statistically significant increase from pre- to post-test in the number of children specifically mentioning "stop at the curb" for both K-3 and 4-6 treatment groups. Pre- and post-test data for both comparison groups remained the same. It should be noted that very few children in all groups mentioned "stop at the curb." Most children gave only one response to this question and that was typically concerned with "looking for cars." The question itself was not worded in such a way that children would assume that multiple responses were expected, and it appears that they gave the one response that they considered to be the most important. In spite of this limitation, however, the pattern of results clearly suggests program impact as the students who received the course changed and those in the comparison group did not.

The "stop at the curb" data for the treatment groups are consistent with those obtained from a similar question in a previous NHTSA-sponsored study on child pedestrian safety messages (Blomberg, et al., 1983). In that study, children in three cities were exposed to a brief (6-7 minute) classroom film plus TV spots on safe street crossing with *Willy Whistle*. All baseline percentages were relatively small in all three cities, ranging from 3% to 7%. Increases after exposure to the messages in two cities were 6% and 11%, respectively. For one city there was no increase.

The percentages of children in the various groups who mentioned "look for cars" in response to Question 1 were:

<u>Response</u>	<u>Evaluation group</u>	<u>Pre-Test</u>	<u>Post-Test</u>
Look for cars	K-3: Treatment	86.5%	89.9%
		Comparison	86.1%
	4-6: Treatment***	94.0%	99.6%
		Comparison	98.4%

*** Chi-square significant at .001 level

All groups in the current study showed very high baseline mentions of "look for cars." They range from 86.1% to 98.4%. The K-3 pre-test data show that almost identical percentages of the treatment and comparison groups mentioned "look for cars" (86.5% and 86.1%, respectively). The post-test data for the K-3 treatment group show a small increase (3.4 percentage points) over the pre-test data which did not reach statistical significance; those for the comparison group show a small decrease. The pre-test data for the 4-6 treatment group show a very high proportion (94.0%) of students who mentioned "look for cars." The post-test data for this group show a statistically significant increase to 99.6%. The pre-test data for the 4-6 comparison group also show a high proportion (98.4%) of students who mentioned "look for cars," and there was a small decrease for the post-test group.

It is apparent from these data that most children in the East Ramapo Central School District knew at the start of the study that they should look for cars before entering the street. For the 4-6 group, this knowledge may have been reinforced by the training program. Even given the extremely high baseline rate of mentions, however, it is noteworthy that almost all of the children in grades 4 through 6 mentioned "look for cars" by the time they had completed the course.

Each child who mentioned the word "look" was then asked to demonstrate *how* the child would look, and the child's actual "look" directions were recorded. Only one response was recorded for this part of the question--whether the child looked left only, right only, left-right, right-left, left-right-left, right-left-right or other direction. To be correct, the child should have looked left, right and then left again.

The resultant frequency table on demonstrated search behavior showed a dramatic change between pre- and post-test measurements. In the pre-test, very few children (less than 2%) in all groups looked in one direction only. Most children (between 56% and 80%) looked either left-right or right-left. A small number (between 5% and 11%) looked left-right-left and an even smaller number (between 4% and 7% looked right-left-right). By far, the largest change from pre- to post-test in both treatment groups was an increase in the number of children looking left-right-left. The percentages of children who looked "left-right-left" across the two measurements were as follows:

<u>Directions looked</u>	<u>Evaluation group</u>	<u>Pre-Test</u>	<u>Post-Test</u>
Left-right-left	K-3: Treatment***	11.4%	46.3%
		Comparison	6.0%
	4-6: Treatment***	14.2%	58.7%
		Comparison	5.5%

*** Chi-square significant at .001 level

The increase for the K-3 treatment group was 34.9 percentage points; that for the 4-6 treatment group was 44.5. This represents over a three-fold increase for each grade level of the treatment groups. There were corresponding decreases in the children who looked left-right and right-left. The percentage of correct responses for the K-3 comparison group decreased from pre- to post-test; that for the 4-6 comparison group increased slightly (by 2.6%). In the previously mentioned study of *Willy Whistle* (Blomberg, et al., 1983), pre- to post-test increases in left-right-left looks for the three cities were 33, 39 and 55 percentage points.

In summary, children in all groups tended to give only one response to the first part of Question 1 (*To be safe, what should you do before crossing the street?*) and that response was overwhelmingly "look for cars." Most children in all groups knew at the start of the program that they should look for cars before crossing the street. As a result of participating in the program, the treatment groups clearly learned *how* to look for cars, that is, they learned to look left-right-left. This pedestrian search behavior is considered critical to safe street crossing. In addition, although the numbers were small, there was an increase in the treatment group children who demonstrated through the survey that they learned to stop at the curb before entering the street.

Question 2: *Make believe you're walking to the bus stop. There is no sidewalk and you must walk in the street. To be safe, what should you do when you must walk in the street?*

The second question dealt with walking in the roadway. Children were asked to describe what they should do to be safe if there was no sidewalk and they had to walk in the street. Correct responses included "walk near the edge of the road," "walk single file," and "walk facing traffic." Multiple responses were coded for this question.

The percentages of children who mentioned "walk near the edge of the road" were as follows:

<u>Response</u>	<u>Evaluation group</u>	<u>Pre-Test</u>	<u>Post-Test</u>
Walk near edge of the road	K-3: Treatment***	19.4%	32.6%
		Comparison*	25.3%
	4-6: Treatment	48.7%	48.3%
		Comparison	51.6%

* Chi-square significant at .05 level

*** Chi-square significant at .001 level

These data show statistically significant increases in the post-test data for both K-3 treatment *and* comparison groups; the increases are 13.2 and 10.1 percentage points, respectively. The data for the 4-6 grade grouping show no significant changes from pre to post, but they do demonstrate a noticeably higher level of response than for the younger group. There are no apparent explanations for these data. The increase among the young comparison group members is particularly puzzling as the discussions with teachers provided no evidence of spillover of the teaching from the treatment groups. It might be noted that an additional 3% to 9% of each group mentioned "walk on grass"--also a correct response to this question.

The percentages of children who mentioned "walk single file" were as follows:

<u>Response</u>	<u>Evaluation group</u>	<u>Pre-Test</u>	<u>Post-Test</u>
Walk single file	K-3: Treatment	-	-
		Comparison	-
	4-6: Treatment*	0.4%	3.1%
		Comparison	-

* Chi-square significant at .05 level

The data for this response are sparse, probably largely because the question was not worded in such a way that children would assume that they were walking with others. None of the K-3 children mentioned the response, and only very small numbers of the 4-6 group did. It is interesting nevertheless to note that there is a statistically significant increase in the post-test results for the 4-6 treatment group which, although small in absolute magnitude, represents in excess of a seven-fold increase.

The percentages of children who mentioned "walk facing traffic" were as follows:

<u>Response</u>	<u>Evaluation group</u>	<u>Pre-Test</u>	<u>Post-Test</u>
Walk facing traffic	K-3: Treatment*	-	1.2%
	Comparison	1.2%	1.2%
	4-6: Treatment**	5.2%	11.6%
	Comparison	6.2%	3.3%

* Chi-square significant at .05 level

** Chi-square significant at .01 level

These data show significant increases in the post-test data for both treatment groups. However, the percentage of K-3 post-test children who responded correctly is not only very small (1.2%) but also equal to the percentage of post-test comparison children who responded correctly. The K-3 comparison group shows no change, and the 4-6 comparison group shows a decrease from pre- to post-test.

In summary, the results of Question 2 show that approximately one-third of the K-3 children and about one-half of the 4-6 children in both treatment and comparison groups know that they should walk near the edge of the road or on the grass if they must walk in the street. However, it appears that pedestrian safety training in the school system or community other than that provided by the school bus program may be responsible for the children's knowledge. However, the training program may be responsible for the fact that a small number of the 4-6 treatment group learned that they should walk single file and walk facing traffic if they must walk in the street. Overall, the pattern of responses to this question do, however, suggest that the curriculum had some impact. The information items covered by this question are somewhat less novel than those covered by Question 1. As such, it might be expected that the curriculum would produce a less pronounced change in them after only a single term's administration.

Question 3: *Make believe you are waiting at the bus stop. To be safe, how far should you stand from the road?*

Question 3 dealt with safe waiting distances at the bus stop. Children were asked how far they should stand from the road to be safe. To be correct, children should have responded "6 feet" (the distance taught to 4-6 children), "3 giant steps" (the distance taught to K-3 children) or some number larger than 6 feet or 3 giant steps. Only a student's initial response was coded for this question.

For the pre-test data, the modal number of children in all groups responded with some value "larger than 6 feet or 3 giant steps." The percentages ranged from 44.6% to 63.3%. This response was expected since existing training in the school district taught the children

that the safe distance to stand from the road was 10 feet. Since K-3 treatment children were taught in the school bus pedestrian safety program that the safe distance to stand away from the road was "3 giant steps," it was anticipated that this response would increase for this group from pre- to post-test. Since older (4-6) children were taught that the safe distance was "6 feet," it was anticipated that this response would increase for this group in the post-test data. The percentages of children who made these specific responses follow:

<u>Response</u>	<u>Evaluation group</u>	<u>Pre-Test</u>	<u>Post-Test</u>
3 giant steps	K-3: Treatment***	0.6%	18.7%
	Comparison	1.8%	1.8%
6 feet	4-6: Treatment***	2.2%	16.6%
	Comparison	2.3%	1.6%

*** Chi-square significant at .001 level

As anticipated, for K-3 students, the number in the treatment group who mentioned "3 giant steps" showed a dramatic increase from pre- to post-test of 18.1 percentage points while the comparison group remained the same. Post-test data for the 4-6 treatment children showed an increase of 14.4 percentage points in the number of children mentioning "6 feet." For the comparison group, the percentages mentioning "6 feet" were very small and decreased slightly from pre- to post-test.

Although the specifically taught response showed a large increase from pre to post in the treatment group, the overall "correctness" of response remained essentially unchanged. The percentages of children mentioning one of the three correct responses (a number equal to or exceeding 3 giant steps or 6 feet) were:

<u>Response</u>	<u>Evaluation group</u>	<u>Pre-Test</u>	<u>Post-Test</u>
≥ 3 giant steps or 6 feet	K-3: Treatment	46.8%	51.3%
	Comparison	47.0%	50.0
	4-6: Treatment	67.4%	64.5%
	Comparison	60.2%	67.5%

Thus, there is evidence that the treatment groups did learn the correct distance to stand from the road (as taught in the program) but did not increase their knowledge of a safe distance to stand from the road, which was already quite high before the program was administered.

It was somewhat disturbing to note that the number of children who mentioned less than 6 feet or 3 giant steps increased for both treatment groups in the post-test as follows:

<u>Response</u>	<u>Evaluation group</u>	<u>Pre-Test</u>	<u>Post-Test</u>
<3 giant steps or 6 feet	K-3: Treatment***	14.5%	25.2%
	Comparison	15.1%	14.0%
	4-6: Treatment**	18.7%	30.1%
	Comparison	23.4%	17.9%

** Chi-square significant at .01 level

*** Chi-square significant at .001 level

As mentioned previously, in its current bus drills, the school district teaches children to stand 10 feet away from the bus. In the interviews, it was noted that many children (in both the pre- and the post-tests) responded "10 feet" to this question. However, in the post-test, it was also noted that some children in the treatment groups responded "3 feet." These children may have meant to say "3 giant steps." Although only the K-3 children were taught to use giant steps (and the 4-6 children were taught to use feet), all children saw the course video. The video was designed for the younger child and refers to distances in giant steps. Learning new numbers (3 giant steps and 6 feet vs. 10 feet) may have been confusing for some of the children. For the older children, learning both a new number and then having a different reference in the video may have been additionally confusing. This type of confusion, if, in fact, it exists, can easily be corrected by the classroom teacher.

In summary, there is clear evidence that the curriculum was effective in gaining the attention of the students concerning the minimum safe distance to stand from the road while waiting at the bus stop. However, the resultant change in survey response suggests that only the description of the correct behavior changed, not the overall knowledge of the safe distance to stand from the road. It is of interest that about one-half of the K-3 children in the district appear to know that they should stand a safe distance from the road while waiting at the bus stop. For the 4-6 children, this percentage increases to about two-thirds.

Question 4: *Make believe you are waiting at the bus stop, and the school bus has just arrived. How do you know when it's safe to board the bus?*

In the fourth question, children were asked how they knew when it was safe to board the bus. The correct response was "the driver signals." Multiple responses were coded for the question. The percentages of children who mentioned "the driver signals" were as follows:

<u>Response</u>	<u>Evaluation group</u>	<u>Pre-Test</u>	<u>Post-Test</u>
The driver signals	K-3: Treatment***	16.0%	33.2%
	Comparison**	14.5%	26.8%
	4-6: Treatment	22.1%	26.6%
	Comparison	31.2%	35.8%

** Chi-square significant at .01 level

*** Chi-square significant at .001 level

The data show increases from pre- to post-test for *all* data groups. The increase is large and statistically significant for both K-3 treatment *and* comparison groups. Other school bus training in the school district may be responsible for the increases in all groups.

By far, the largest response to this question by all groups was "when the bus stops/the red lights flash/or the stop arm comes out," as follows:

<u>Response</u>	<u>Evaluation group</u>	<u>Pre-Test</u>	<u>Post-Test</u>
Bus stops/lights flash/stop arm comes out	K-3: Treatment***	53.5%	35.3%
	Comparison*	59.0%	45.1%
	4-6: Treatment	73.8%	69.5%
	Comparison	62.5%	52.8%

* Chi-square significant at .05 level

*** Chi-square significant at .001 level

Again, the data show statistically significant differences from pre- to post-test for both K-3 treatment and comparison groups. As mentioned previously, this may reflect the influence of other school bus training in the district. However, it is gratifying to note a decrease in this response for all groups from pre- to post-test. Apparently the children are learning that this is not a safe response; however, they obviously need more training in the fact that they should never approach the bus until the driver signals that it is safe to do so. This is consistent with the design intent of the curriculum which has the lessons repeated year-to-year for reinforcement.

Question 5: *Make believe you're on the bus and it has just stopped at your bus stop. When you leave the bus, you must cross the street to get home. Tell me what you should do to get from your seat off the bus and across the street safely to your home.*

The fifth question was designed to explore the children's knowledge of safe bus exiting and street crossing procedures. Children were asked to assume that the bus had just arrived at their stop and that their home was on the other side of the street. They were then asked to describe what they should do to get from their seats off the bus and across the street safely to their homes. This question provided the children with an opportunity to describe safe bus exiting and street crossing procedures in a story-telling format. Multiple responses were coded.

It was recognized that the question was comprehensive and that the number and nature of responses would depend not only on the child's knowledge but also on the child's story-telling abilities. It was anticipated that "complete" responses would be rare, that is, responses that identified all major safety rule behaviors. However, the question was designed to elicit the children's knowledge of one or more safe school bus exiting and street crossing behaviors. In fact, 10 *basic* behaviors were categorized from the pre-coded and write-in responses. Since three of these included variations of a basic behavior, a total of 16 behaviors was identified for analysis, as follows:

- Wait for the bus to stop/door to open/driver to say it's OK to leave
- Wait for those in front to go first
- Use handrail when exiting
- Look to the right before exiting
- (Move a safe distance from the side of the bus)
 - Move ≥ 6 feet from side
 - Walk to sidewalk/away from bus/on grass
 - Make sure driver can see you
- (Move a safe distance forward of the bus)
 - Move ≥ 10 feet forward of the bus
 - Move around crossover arm
 - Move forward of the bus
- Wait for driver's signal
- Stop at edge of bus
- (Look for cars)
 - Look for cars
 - Look both ways for cars
 - Look left-right-left for cars
- Look for cars while crossing

The list shows that the data obtained were not always as specific as would be desired. For example, some children indicated that they would exit the bus and move to the sidewalk without indicating how far (in terms of feet or giant steps) they would move from the side of the bus to be safe. However, all of the above responses were coded and analyzed.

Responses that showed statistically significant increases between pre- and post-test data for the K-3 treatment group are given below, along with their comparison school data. Excluded are those responses for which *both* treatment and comparison group increases were statistically significant. The results are as follows:

<u>Response</u>	K-3		<u>Pre-Test</u>	<u>Post-Test</u>
	<u>Evaluation group</u>			
Walk to sidewalk away from bus	Treatment*		4.0%	7.7%
	Comparison		3.6%	8.5%
Wait for driver's signal	Treatment**		5.8%	13.4%
	Comparison		8.4%	10.4%
Look left-right-left for cars	Treatment*		-	1.2%
	Comparison		-	-
Look for cars while crossing	Treatment***		17.8%	42.7%
	Comparison		27.1%	28.7%

* Chi-square significant at .05 level

** Chi-square significant at .01 level

*** Chi-square significant at .001 level

These data show significant increases in post-test mentions for a variety of correct bus exiting and street crossing behaviors for the K-3 treatment group. The largest increase (24.9 percentage points--more than a doubling) was for "look for cars while crossing." In fact, it was the largest statistically significant increase for either treatment group on this question. Other behaviors for which there were small post-test increases for the K-3 group were "walk to sidewalk away from the bus" (3.7 percentage point increase), "wait for driver's signal" (7.6 percentage point increase), and "look left-right-left for cars" (1.2 percentage point increase).

Responses for which the 4-6 treatment group had statistically significant increases (without corresponding increases for the comparison group) were as follows:

<u>Response</u>	4-6		<u>Pre-Test</u>	<u>Post-Test</u>
	<u>Evaluation group</u>			
Wait for those in front to go first	Treatment**		-	3.5%
	Comparison		0.8%	4.1%
Move 10 feet forward of bus	Treatment***		10.5%	27.4%
	Comparison		10.9%	10.6%
Wait for driver's signal	Treatment***		16.5%	29.3%
	Comparison		21.1%	19.5%
Look left-right-left for cars	Treatment**		0.4%	4.2%
	Comparison		-	-

** Chi-square significant at .01 level

*** Chi-square significant at .001 level

These data show that significant increases of more than 10 percentage points in post-test mentions of correct behaviors were achieved by the 4-6 treatment group for the following behaviors: "move 10 feet forward of the bus" (16.9 percentage points) and "wait for driver's signal" (12.8 percentage points). Smaller statistically significant increases were obtained for the following behaviors: "wait for those in front to go first" (3.5 percentage points) and "look left-right-left for cars" (3.8 percentage points).

The 16 behaviors were combined into the 10 basic groups listed previously. The results are shown in Table 4. This table shows that the two behaviors mentioned most frequently by all K-3 groups (treatment and comparison) were "look for cars" and "look for cars while crossing." They are followed by the behaviors "move away from the side of the bus" and "wait for the bus to stop." As indicated previously, the major positive change indicated by this question for the K-3 treatment group is the increase in mentions of "look for cars while crossing."

For the 4-6 group, "look for cars" and "look for cars while crossing" were also among the top mentions for both treatment and comparison groups. Also mentioned frequently were "wait for the bus to stop," "move away from the side of the bus," and "move forward of the bus." Thus, mentions of the danger zones were more frequent by this age group than by the K-3 group. The largest statistically significant increase (29.9 percentage points) for the 4-6 treatment group occurred in mentions of the behavior "move forward of the bus."

It is interesting to compare entries in Table 4 with the corresponding entries in Table 5 (which presents results of a staged evaluation of bus exiting and street crossing behaviors). As an example, although less than 6% of the children mentioned using the handrail when telling their stories, about four-fifths of the K-3 children actually used the handrail when exiting and about two-fifths of the 4-6 children did. The children also mentioned looking for cars more often than they actually were coded as searching in the staged situation. At least part of the difference between the stated degree of search and the measured behavior may be a result of the inability of observers to determine accurately when a child searches using eye movements alone without executing an obvious head turn.

Knowledge test: Composite score and summary

A composite score for the knowledge test was computed for each student. The maximum score for any child was 8. In this score, a maximum of three points were given to question 1--one each for mentions of "stop at the curb" and "look for cars" and one for actual demonstration of the correct way to look for cars (left-right-left). Questions 2 through 4 were given one point each for correct responses. Question 5 was given a maximum of two points--one for mentions of search for cars and one for mentions of staying out of the danger zones.

Table 4. Question 5: Bus Exiting and Street Crossing Behaviors Mentioned

<u>Behavior</u>	<u>Evaluation group</u>	<u>Pre-Test</u>	<u>Post-Test</u>
Wait for bus to stop	K-3: Treatment	12.3%	10.1%
	Comparison	20.5%	18.3%
	4-6: Treatment	18.7%	21.6%
	Comparison	20.3%	24.4%
Let those in front go first	K-3: Treatment	1.2%	0.9%
	Comparison	-	1.8%
	4-6: Treatment**	-	3.5%
	Comparison	0.8%	4.1%
Use handrail when exiting	K-3: Treatment	5.2%	5.9%
	Comparison	4.2%	3.0%
	4-6: Treatment	9.7%	12.4%
	Comparison**	16.4%	5.7%
Look right before exiting	K-3: Treatment	0.6%	0.6%
	Comparison	-	-
	4-6: Treatment	0.7%	1.5%
	Comparison	-	1.6%
Move away from side of bus	K-3: Treatment	12.6%	16.3%
	Comparison	12.7%	13.4%
	4-6: Treatment	38.2%	35.1%
	Comparison*	24.2%	39.0%
Move forward of bus	K-3: Treatment**	3.1%	8.6%
	Comparison	4.8%	8.5%
	4-6: Treatment***	16.5%	45.9%
	Comparison	16.4%	20.3%
Wait for driver's signal	K-3: Treatment**	5.8%	13.4%
	Comparison	8.4%	10.4%
	4-6: Treatment***	16.5%	29.3%
	Comparison	21.1%	19.5%
Stop at edge of bus	K-3: Treatment	0.3%	1.8%
	Comparison	0.6%	1.2%
	4-6: Treatment**	3.0%	9.3%
	Comparison*	0.8%	5.7%
Look for cars	K-3: Treatment**	45.2%	32.9%
	Comparison	43.4%	35.4%
	4-6: Treatment	44.2%	49.8%
	Comparison**	29.7%	46.3%
Look for cars while crossing	K-3: Treatment***	17.8%	42.7%
	Comparison	27.1%	28.7%
	4-6: Treatment	41.9%	40.2%
	Comparison	36.7%	35.8%

- * Chi-square significant at .05 level
- ** Chi-square significant at .01 level
- *** Chi-square significant at .001 level

Frequency distributions of total scores showed that, with the exception of one child in the 4-6 treatment group, no pre-test children achieved a score higher than 5. For the post-test data, comparison group children still did not achieve scores higher than 5 whereas some children in both treatment groups achieved the maximum score of 8. The data for children achieving a score of at least 4 were as follows:

<u>Knowledge test</u>	<u>Evaluation group</u>	<u>Pre-Test</u>	<u>Post-Test</u>
Composite score of 4 or more	K-3: Treatment***	4.9%	29.7%
		Comparison	6.1%
	4-6: Treatment***	18.7%	56.0%
		Comparison	17.2%

*** Chi-square significant at .001 level

The listing shows significant and dramatic increases from pre- to post-test in knowledge scores of 4 or greater for both treatment groups whereas those for both comparison groups remained unchanged. For the treatment groups, scores of 4 or more increased by 24.8 percentage points for the K-3 children (a six-fold increase) and by 37.3 percentage points for the 4-6 children (virtually a three-fold increase).

In summary, with a few exceptions, the knowledge test data showed increases in correct responses for post-test vs. pre-test data for the treatment groups relative to the comparison groups. In many cases the correct knowledge base was not large and the increases also were not large. However, the overall pattern of results leaves little doubt that overall knowledge of school bus pedestrian safety increased as a result of participation in the program. Furthermore, given the design intent of the curriculum, further longitudinal knowledge increases as students receive more than one year's training can be expected.

F. BEHAVIOR EVALUATION--EXITING THE BUS AND CROSSING THE STREET

A staged situation was used to test behaviors involved in exiting the bus and crossing the street. This paradigm was chosen instead of observing actual bus operations since most routes in the East Ramapo Central School District are set to avoid the need for street crossings. Therefore, amassing a sufficient sample size for analysis would have been problematic.

In order to collect data, a school bus was positioned in the driveway in front of each test school on the opposite side of the driveway from the school. Cones were used to close the driveway to other traffic. A plastic barrel placed in front of the school was designated as "home." A diagram showing positions of the school, school bus and plastic barrel is given in Figure 2.

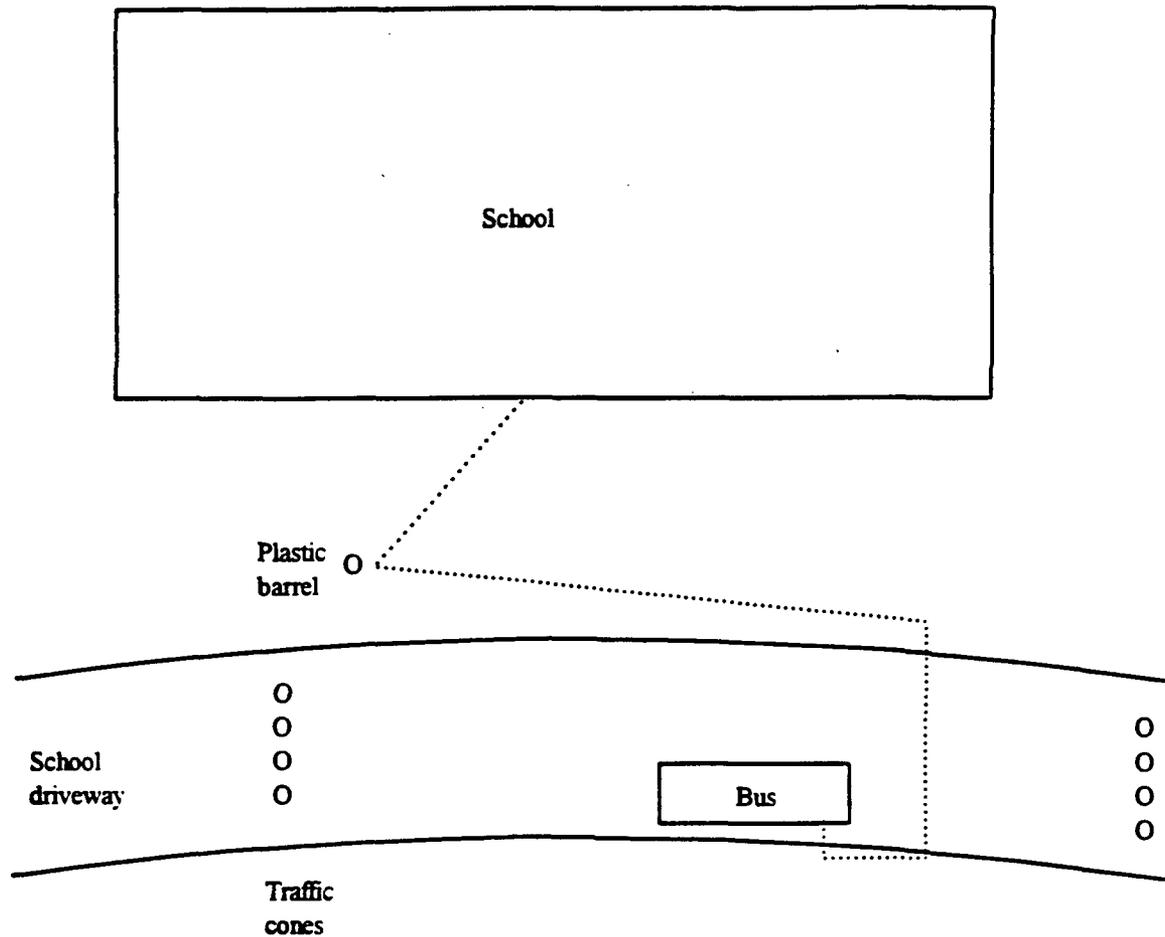


Figure 2. Diagram of staged behavior evaluation situation.

Three individuals supported the data collection effort. A substitute teacher received the children from the classroom teacher, gave all instructions to the children and stayed with the children until the last child had left the bus. A trained bus driver sat in the bus driver's seat, gave the child the signal to cross the street if the child looked for one, and assured that each child who left the bus returned inside the school building. A trained observer (stationed outside the bus) notified the substitute teacher by a pre-arranged hand signal when each child should be directed to leave the bus and marked each child's exiting and street crossing performance data on a prepared form. Detailed procedures and the data collection form are given in Appendix D.

The same school classes that participated in the knowledge test also participated in the staged evaluation of student behaviors. Since the knowledge and skill tests were not always

given on the same day, the numbers of students in each group varied slightly. In all, 1,768 students participated in the staged evaluation. They were distributed as follows:

		<u>Pre-Test</u>	<u>Post-Test</u>	<u>Total</u>
K-3:	Treatment students	330	344	674
	Comparison students	168	160	328
4-6:	Treatment students	270	257	527
	Comparison students	<u>131</u>	<u>108</u>	<u>239</u>
	Total	899	869	1,768

Children were brought to the front of the school building one class at a time. The substitute teacher explained the procedures to be followed, and then the entire class crossed the street and boarded the bus. The children were directed to sit on the right side of the bus (opposite the school) so that they would not be able to see their classmates cross the street from the bus. When all children were seated, the following instructions were given:

Now you are riding home on the school bus at the end of the day. When I point to you and tell you to go home, the bus has arrived at your bus stop. Then you will show us how you would safely leave the bus, cross the street and touch "home." Then you should join your teacher at [designated place].

Then one child at a time was directed to leave the bus and go "home." The following instructions were given to each child:

We have arrived at your bus stop. Please go home.

This exercise was designed to permit children to demonstrate the following safe exiting and street crossing behaviors:

- Hold the handrail while exiting
- Look right before exiting to check for cars trying to sneak by on the right
- Move a safe distance away from the side of the bus
- Move a safe distance forward of the bus
- Wait for the driver's signal before crossing
- Stop at the edge of the bus
- Look for cars
- Cross the street while continuing to look for cars

The observer recorded aspects of each child's behavior while exiting and crossing the street. In addition, a measurement was made of where the child arrived on the opposite side of the street relative to the front of the bus.

Although it was a staged situation, an effort was made *not* to have the children feel that they were being tested. Instructions, therefore, avoided any mention that it was a test. Although an observer was clearly positioned to record data for each child, most children exited the bus and crossed so quickly that they did not seem to notice the observer.

Every effort was made to maintain an appropriate school environment throughout the exercise. However, it was noticed during the conduct of the test that many of the children were not taking the exercise seriously. The children seemed excited about leaving the classroom for the bus exercise and, as indicated previously, seemed to exit and cross so quickly that they gave the impression that they considered the activity to be a game.

The results of this exercise are given in Table 5, which shows the percentage of children in each group who performed each safety critical behavior correctly. In general, the data were disappointing and did not show significant improvements in the post-test performance of the treatment groups versus the comparison groups. In some instances, where a significant increase was obtained in the data for a treatment group, a corresponding significant increase was also obtained for the comparison group. In other instances when test data were significant, they represented *decreases* in safe behavior from pre- to post-test. Sometimes there were significant increases in comparison and not in treatment data. In only two instances (both for the K-3 group) were there statistically significant increases in the treatment data with no corresponding significant increases in the comparison data. They were for "stop at edge of bus (full/partial)" (7.0 percentage point increase) and "look left-right-left for cars" (7.8 percentage point increase).

Summary comments on each behavior follow:

- Use handrail when exiting: Overall, 64.1% of the children in the sample used the handrail when exiting. Approximately 80% of K-3 children used the handrail in contrast to about 40% of the 4-6 children. There are two possible explanations for this fact. One (noticed by the observer) is that some older children are so tall that their arms don't "reach down" to the handrail. The other is that older children may not find it "cool" to use the handrail. Young children appear to find the handrail functional.
- Look right before exiting: Very small numbers in all groups looked to the right before exiting the bus. This behavior is not typically taught in school bus safety programs and may not have been emphasized in the classroom in a single year's application. Obviously, this behavior will need to be impressed on children in the future so that it becomes routine when they exit the bus.

Table 5. Behaviors Exhibited: Bus Exiting and Street Crossing Exercise

<u>Behavior</u>	<u>Evaluation group</u>	<u>Pre-Test</u>	<u>Post-Test</u>
Use handrail when exiting	K-3: Treatment	80.0%	80.5%
		Comparison	85.1%
	4-6: Treatment		46.3%
		Comparison	38.2%
Look right before exiting	K-3: Treatment*		2.4%
		Comparison	1.2%
	4-6: Treatment		0.7%
		Comparison	0.8%
Move 6 feet from side	K-3: Treatment***		9.7%
		Comparison***	36.3%
	4-6: Treatment		48.1%
		Comparison	17.6%
Move 10 feet forward of bus	K-3: Treatment		29.7%
		Comparison	23.2%
	4-6: Treatment***		65.8%
		Comparison	52.7%
Wait for driver signal	K-3: Treatment		16.1%
		Comparison	20.8%
	4-6: Treatment		29.6%
		Comparison**	24.4%
Stop at edge of bus (full/partial)	K-3: Treatment*		14.8%
		Comparison	11.6%
	4-6: Treatment		36.4%
		Comparison***	20.6%
Look left-right-left for cars	K-3: Treatment**		5.0%
		Comparison	4.9%
	4-6: Treatment		17.5%
		Comparison***	7.6%
Cross street looking left and right	K-3: Treatment		25.5%
		Comparison	25.0%
	4-6: Treatment		34.6%
		Comparison	30.5%
Arrive \geq 1 foot forward of bus front	K-3: Treatment***		20.3%
		Comparison***	36.6%
	4-6: Treatment***		46.1%
		Comparison	22.1%

* Chi-square significant at .05 level
 ** Chi-square significant at .01 level
 *** Chi-square significant at .001 level

- Move 6 feet from side: Substantial increases in safe performance were obtained for both K-3 treatment and comparison groups, and data for both were statistically significant. Decreases in safe performance were obtained for both 4-6 treatment and comparison groups. There is no obvious explanation for these data.
- Move 10 feet forward of bus: The data obtained for this behavior were similar to those described above for moving a safe distance away from the side of the bus. Increases in safe performance were obtained for both K-3 treatment and comparison groups and decreases were obtained for both 4-6 treatment and comparison groups.
- Wait for driver's signal: Increases in safe performance were obtained by all groups, and those for the 4-6 comparison group were statistically significant. It is interesting to note that 20% to 25% of the K-3 children waited for the driver's signal whereas about 40% of the 4-6 children did.
- Stop at edge of bus: Statistically significant increases in full or partial stops at the edge of the bus were obtained by the K-3 treatment group and the 4-6 comparison group. Older children exhibited this safe behavior more frequently than did the younger ones.
- Look left-right-left for cars: Statistically significant increases in safe performance were obtained by the K-3 treatment group and the 4-6 comparison group. Again, older children exhibited this safe behavior more frequently than did the younger ones.
- Cross street looking left and right: Increases in safe performance were obtained by all except the 4-6 treatment group.
- Arrive \geq 1 foot forward of bus front: Children in all groups tended to cross the street at an angle--possibly a natural crossing considering the location of "home" and the school entrance relative to the front of the bus. Angle crossing was more frequent in the post-test than in the pre-test data.

It might be noted that no K-3 treatment children crossed the street behind the bus, although nine comparison children did (four in the pre- and five in the post-test). For the 4-6 group, one treatment child crossed behind the bus in the pre-test, and two comparison children crossed behind the bus in the post-test.

As was done for the knowledge test, a composite score was computed for each child. All behaviors shown in Table 5 were included in the analysis with the exception of the last-listed behavior (arrive \geq 1 foot forward of bus front). For the skill of looking for cars while crossing the street, credit was given for any look regardless of direction. One point was

given to each child for each behavior performed correctly. Therefore, the maximum score for the staged evaluation exercise was 8. The data for children receiving a score of at least 4 were as follows:

<u>Staged behavior</u>	<u>Evaluation group</u>	<u>Pre-Test</u>	<u>Post-Test</u>
Composite score of 4 or more	K-3: Treatment***	14.8%	29.9%
	Comparison	17.3%	21.3%
	4-6: Treatment	37.4%	33.9%
	Comparison	19.1%	27.8%

*** Chi-square significant at .001 level

The listing shows a statistically significant increase from pre- to post- test only for the K-3 treatment group. For that group, scores of 4 or more doubled from 14.8% to 29.9% of the observations. Thus, even though the individual behaviors did not exhibit a consistent pattern of improvements, the younger treatment group did show a large increase in overall safety behavior. This improvement was not mirrored in the 4-6 treatment group which showed a largely ambiguous pattern of results.

G. BEHAVIOR EVALUATION--WAITING FOR AND BOARDING THE BUS

The second evaluation of behaviors involved actual observations of children waiting for and boarding the bus for school. One of three observers rode 17 bus routes during morning runs. Thirteen of the routes served treatment schools and four served comparison schools. Observers recorded data on only one child at each stop on each route. If children boarded from both sides of the street at any given stop, the opposite-side boarder was given preference for data recording. Detailed procedures and the data collection form appear in Appendix D.

The final sample consisted of 331 children. The children were distributed by grade level as follows:

	<u>Pre-Test</u>	<u>Post-Test</u>	<u>Total</u>
K-3: Treatment students	45	63	108
Comparison students	30	22	52
4-6: Treatment students	79	63	142
Comparison students	<u>12</u>	<u>17</u>	<u>29</u>
Total	166	165	331

Most (84.9%) of the children were same-side boarders; that is, they waited on the same side of the street on which the bus stopped. Only 15.1% were opposite-side boarders, that is, they had to cross the street to board the bus. In terms of same- vs. opposite-side boarding, the children were distributed as follows:

		<u>Pre-Test</u>	<u>Post-Test</u>	<u>Total</u>
Same side:	Treatment students	103	112	215
	Comparison students	35	31	66
Opposite side	Treatment students	21	14	35
	Comparison students	<u>7</u>	<u>8</u>	<u>15</u>
Total		166	165	331

The observations were designed to evaluate the following behaviors:

- Wait a safe distance from the road
- Form a waiting line as the bus approaches
- For same-side boarders:
 - Wait for the driver's signal before moving toward the bus
- For opposite-side boarders:
 - Wait for the driver's signal before approaching the street
 - Stop at the curb
 - Look left-right-left for cars
 - Cross the street while continuing to look for cars
 - Cross the street a safe distance in front of the bus
 - Walk a safe distance from the side of the bus
- Use the handrail when boarding

For the first of the above-listed behaviors (wait a safe distance from the road), the "worst-case" child was recorded. Thus, if one child was standing in the road (and all others on the sidewalk), the observer estimated the distance from the curb of the child standing in the road and entered a negative value for that bus stop on the data sheet. For the second behavior (form a line as the bus approaches), the entire group behavior was evaluated. Then, as mentioned previously, for the remaining behaviors the activities of the first child to move were observed. Thus, again, the "worst case" child in terms of early movement toward the bus was recorded.

Since the comparison group sample size was small (particularly for opposite-side boarders), the grade groupings were combined for all analyses performed on the data. As with the previous evaluation analyses, Chi-square values and percentages were calculated for all frequency data.

In terms of waiting distance from the road, the data showed that, overall, 34.8% of the treatment group and 45.7% of the comparison group children were standing *at the curb or in the road* when the bus approached. For analysis of these data, 5 feet (rather than 6 feet as taught in the curriculum) was selected as the minimum distance since observers frequently tend to record measurements in 5-foot units. The percentages of children who were waiting 5 or more feet back from the curb were as follows:

<u>Behavior</u>	<u>Evaluation group</u>	<u>Pre-test</u>	<u>Post-test</u>
Wait 5+ ft from road	Treatment**	13.7%	27.0%
	Comparison*	11.9%	30.8%

* Chi-square significant at .05 level

** Chi-square significant at .01 level

The data show statistically significant increases in both groups in the children who stand a safe distance from the roadway while waiting for the bus.

In terms of form of waiting, for 45.6% of the treatment school stops and 55.6% of the comparison school stops, there was only one child waiting and, therefore, the form of waiting was not applicable. For the remaining stops, children who waited essentially in a line to board the bus were distributed as follows:

<u>Behavior</u>	<u>Evaluation group</u>	<u>Pre-test</u>	<u>Post-test</u>
Wait in line	Treatment	31.1%	46.8%
	Comparison	21.1%	35.3%

Again, the data show increases in safe behavior for both groups, but the data are not statistically significant. For the treatment group, post-test data show almost one-half of the children waiting in line compared to almost one-third of the children in the pre-test data.

For same-side boarders, observations were made of when the first child at the bus stop moved toward the bus. The following data were obtained:

<u>Move toward bus:</u>	<u>Evaluation group</u>	<u>Pre-test</u>	<u>Post-test</u>
Before bus stopped	Treatment	25.2%	23.2%
	Comparison	31.4%	35.5%
When bus stopped	Treatment	39.8%	22.3%
	Comparison	40.0%	12.9%
When door opened	Treatment	25.2%	40.2%
	Comparison	25.7%	41.9%
When driver signaled	Treatment	9.7%	14.3%
	Comparison	2.9%	9.7%

Very similar patterns are shown in the data. In both treatment and comparison groups, approximately the same percentage moved toward the bus before the bus stopped in both the pre- and post-test (about one-quarter of the treatment group and about one-third of the comparison group). There was a large drop from pre- to post-test in both groups in the percentage who moved when the bus stopped, and there were increases in those who waited till the door opened or the driver signaled.

An analysis of those who waited for the driver's signal revealed the following:

<u>Behavior</u>	<u>Evaluation group</u>	<u>Pre-Test</u>	<u>Post-Test</u>
Wait for driver signal	Treatment	13.0%	18.6%
	Comparison	4.2%	15.0%

The data show increases from pre- to post-test in the children waiting for the driver's signal before moving toward the bus but neither increase is statistically significant.

The children who waited *at least* until the door opened before moving to the bus (that is, waited until the door opened *or* the driver signaled) were distributed as follows:

<u>Behavior</u>	<u>Evaluation group</u>	<u>Pre-Test</u>	<u>Post-Test</u>
Wait for door to open	Treatment**	35.0%	54.5%
	Comparison	28.6%	51.6%

** Chi-square significant at .01 level

The significant increase from pre- to post-test in the treatment group children who waited at least until the door opened before moving toward the bus is noteworthy. However, it is apparent from the data that the children need more emphasis on the fact that the safest procedure is to wait for the driver's signal.

The actions of the first *opposite-side boarder* to move toward the bus were tracked until that boarder boarded the bus. The first behavior observed was whether or not the child looked for the driver's signal before attempting to cross the street. The data obtained were as follows (the reader is reminded that the sample size for opposite-side boarders is small):

<u>Behavior</u>	<u>Evaluation group</u>	<u>Pre-test</u>	<u>Post-test</u>
Look for driver signal	Treatment*	52.4%	85.7%
	Comparison	85.7%	75.0%

* Chi-square significant at .05 level

The data show a statistically significant increase (33.3 percentage points) from pre- to post-test in the number of opposite-side boarders in the treatment group who looked for the driver's signal before moving toward the street.

The same child who first moved toward the street was then observed to determine whether or not that child stopped at the curb. The data obtained were as follows:

<u>Behavior</u>	<u>Evaluation group</u>	<u>Pre-test</u>	<u>Post-test</u>
Stop at curb	Treatment	19.0%	35.7%
	Comparison	28.6%	12.5%

The data show an increase from pre- to post-test for the treatment group and a decrease for the comparison group in the number of children stopping at the curb before crossing the street but neither change reached statistical significance given the small sample sizes.

Children who looked for cars *before entering the street* were distributed as follows:

<u>Behavior</u>	<u>Evaluation group</u>	<u>Pre-test</u>	<u>Post-test</u>
Look for cars	Treatment	57.1%	78.5%
	Comparison	57.1%	42.9%

Again, although not statistically significant, the effects are in the desired direction, and almost four-fifths of the post-test treatment group children looked for cars before crossing the street. The comparison group children showed a decrease in this behavior from pre- to post-test.

Children who looked for cars *while crossing the street* were distributed as follows:

<u>Behavior</u>	<u>Evaluation group</u>	<u>Pre-test</u>	<u>Post-test</u>
Look for cars while crossing	Treatment	52.4%	50.0%
	Comparison	42.9%	14.3%

The listing shows that about 50% of the treatment children looked for cars while crossing both in the pre-test and post-test exercises. Even smaller numbers of the comparison school children did so.

Since a crossover arm was in use on all the buses during the test, all opposite-side boarders were visible to the driver at all times while they were in front of the bus. After they crossed the street, the observer noted how far the child walked from the side of the bus. In the pre-test, all of the children walked within 2 feet of the side of the bus. In the post-test, some treatment children walked 3 to 4 feet from the side of the bus. No children

walked 6 feet from the side of the bus (as recommended in the curriculum). The data for children who walked 3 or 4 feet from the side of the bus follow:

<u>Behavior</u>	<u>Evaluation group</u>	<u>Pre-test</u>	<u>Post-test</u>
Walk 3-4 ft from side of bus	Treatment***	-	42.9%
	Comparison	-	-

*** Chi-square significant at .001 level

It is apparent from these data that, although the curriculum apparently produced a meaningful improvement, children would benefit from additional training on the importance of standing a safe distance from the side of the bus. This would likely come from the longitudinal application of the program in accordance with its design objectives.

Each child (both *same-side and opposite-side boarders*) was observed to see if the child used the handrail when boarding the bus. The data obtained were as follows:

<u>Behavior</u>	<u>Evaluation group</u>	<u>Pre-test</u>	<u>Post-test</u>
Use handrail when boarding	Treatment***	46.8%	25.4%
	Comparison	52.4%	38.5%

*** Chi-square significant at .001 level

The listing shows a *decrease* in handrail use from pre- to post-test for both groups. There is no apparent explanation for the decrease in handrail use.

It is interesting to compare the relatively low overall handrail use in boarding the bus (38.4%, as obtained in this evaluation exercise) with the relatively high handrail use when exiting the bus (64.1%, as obtained in the staged evaluation exercise concerned with exiting the bus and crossing the street). There is no logical reason why exiting the bus should be considered to be a more difficult task than entering the bus--although possibly an exiting fall might be viewed as more serious than an entering one. One possible explanation for the difference in use is the fact that this exercise took place as the children actually boarded the bus for school in the morning. Possibly the children had objects in their hands that prevented them from holding the handrail when they boarded the bus. In the staged evaluation, all children came from and returned to their classrooms and did not bring any materials with them.

In summary, the treatment group children observed in this exercise exhibited some pre- to post-test improvements in safe behaviors related to waiting for and boarding the bus. They increased their waiting distance from the curb (although comparison children did also), same-side boarders waited at least until the driver opened the door before moving toward

the bus, and opposite-side boarders increased looking for the driver's signal before moving toward the bus. In addition, opposite-side boarders increased the distance they walked away from the side of the bus although they did not increase this distance to the amount recommended in the curriculum.

H. PROCESS EVALUATION

A review committee consisting of elementary school teachers and an education consultant provided continuing evaluations of program materials as they were being developed. In addition, the process evaluation included teacher evaluations of individual lessons, meetings with teachers to obtain suggestions for course revisions, and debriefings of school principals. Each of these is briefly described in the following paragraphs.

Review committee evaluations. The review committee served in an advisory capacity throughout the course development and revision process. In addition to a nationally-prominent education consultant, the committee consisted of nine teachers of elementary school grades including teachers specializing in special education and gifted education. During the course development process, the committee members suggested appropriate teaching techniques and reviewed all classroom materials (lesson plans and videos) to assure appropriateness of design and content. Following presentation of the pilot program, the teachers on the committee provided critiques of the program and its presentation at their schools.

The teachers responded very positively to the program and received positive inputs from other teachers in their schools. They found the teacher instructions to be appropriate, the time for each lesson to be adequate, and the resource materials included with each lesson helpful. In addition, they noted no problems in adapting the materials to meet the needs of special students. Some specific recommendations were made for revising course materials. These included, as examples, deleting knowledge of the location of the ignition switch (in case of bus driver incapacitation) for very young children and providing specific things for children to look for when they are viewing a video that they have seen the previous year. The program materials were revised to accommodate all appropriate teacher suggestions.

Individual lesson evaluations. An evaluation form was included at the end of each lesson in each *Teacher's Guide*. A copy of the form is shown in Figure 3. Teachers were asked to complete and return each lesson's form at the completion of the lesson. In all, 216 forms were returned by the teachers, 95 for K-3 classes and 121 for 4-6 classes. The forms were used primarily to determine whether one-half hour was a reasonable time frame for the lessons, to identify problems in presenting lessons and to obtain the teachers' suggestions for improving the lessons.

EVALUATION FORM: (Use reverse side for additional space)

Grade: _____

Lesson No. _____

Time to complete the lesson: _____ minutes

How closely did you follow the lesson plan?

_____ No changes _____ Slight changes _____ Major changes

If you made changes, please explain what they were:

Did you use any of the extension/follow-up activities?

_____ yes _____ no

If yes, which ones?

Did you have any problems in presenting the lesson?

_____ yes _____ no

If yes, please explain:

Please provide any suggestions or comments that you care to make about the lesson or program:

Figure 3. Individual lesson evaluation form.

Teachers covered individual lessons in time frames ranging from 10 to 70 minutes, depending on class capabilities and the number of extension/follow-up activities the teacher elected to include in the lesson. The average time reported by teachers for K-3 classes was 27 minutes; that for 4-6 classes was 34 minutes. Since these times include selected extension/follow-up activities, it was concluded that one-half hour was a reasonable time period to specify for the lessons.

Other comments made by the teachers served as inputs to the revision process. They were combined with information obtained from the review committee and from teacher meetings and used to improve the final curriculum.

Teacher meetings. After the completion of the program, two meetings were held with East Ramapo Central School District teachers--one with teachers from kindergarten through grade three and one with teachers from grades 4 through 6. Representatives from each treatment school and from each grade were present. The purpose of the meetings was to critique the curriculum materials and identify where changes were needed.

It was learned that, in general, the curriculum materials were distributed to the teachers by the school principals without further instructions. The teachers found that the introductory pages in each package were clear and provided sufficient information for them to understand the program and proceed to teach it. The lesson plans and videos were well received. The estimated time (one-half hour) for each lesson was adequate. Teachers felt strongly that the program should be implemented early in the fall of the year.

Suggestions were made to improve individual lessons, and these were incorporated in the final version delivered to NHTSA, when appropriate. A major concern was that children frequently know and can give correct answers to safety rules in the classroom but then fail to follow those rules in real-life situations. Children just do not think accidents will happen to them. The teachers requested that personal stories be included in the program so that children will know the consequences of not following safe behaviors. Such stories and other activities were added to the lessons for each grade in an attempt to make children appreciate the dangers of not following safety rules.

Principal debriefings. A final debriefing was held with each treatment school principal to obtain program information from their perspective. Comments were very positive ("outstanding curriculum," "clearly laid out") from all schools except one. At that school, teachers could not relate to the fact that the curriculum was designed as a national program. They could relate only to their own school district, and they felt their existing school bus safety program was adequate. Most principals found the program to be very worthwhile and reported that the feedback they got from teachers was very positive. As the teachers did, the principals expressed concern that children know safety rules but do not follow them, and, therefore, there is a clear need for this new curriculum.

Overall, the debriefings and process analysis indicated quite convincingly that the curriculum was on the right track. Several constructive comments were received and included in the final version of the program. Even the reaction of the single school which clearly was disinterested in serving as a pilot test site provided valuable information for the promotional material.

V. DISCUSSION

In order to be successful, a school-based curriculum to improve school bus pedestrian safety must reduce crash risk, be acceptable to school administrators and teachers and be effectively marketed or distributed to a large number of schools. The results of the present study strongly suggest that the final curriculum delivered to NHTSA will be effective in all three areas.

A. CRASH RISK REDUCTION

As discussed in Section IV, a crash-based evaluation was not possible. Time limitations also precluded assessing the full longitudinal impact of the curriculum. Nevertheless, the evaluation still yielded a clear indication that critical behaviors associated with crash avoidance were significantly improved even by a single year's application of the program. The improvement in knowledge of correct search is particularly indicative as previous research showed this level of improvement of search knowledge among children to be associated with an extremely meaningful crash reduction (Blomberg, et al., 1983). The dramatic shift in the composite safety index for both the knowledge and staged behavior measures provide further support for a conclusion that the course, when made a part of the regular curriculum, is capable of training students to reduce their crash risk on the trip to and from school.

Although it was possible to conclude that the curriculum would have a positive effect on crash occurrence, no attempt was made as part of this study to estimate the *extent* of crash reduction which the curriculum might be expected to produce when completely implemented. There is simply not enough information to support such conjecture. Moreover, there is no compelling need for a precise estimate of crash reduction potential as the program is already well on its way to national distribution.

B. ACCEPTABILITY

The study also did not include a comprehensive survey of the acceptability of the curriculum to school administrators, teachers and curriculum specialists. It was, however, sensitive to this aspect from the outset. It was precisely for this reason that a nationally renowned curriculum specialist and an advisory panel of teachers were employed throughout the development and evaluation processes. The reactions of the participating professionals from the test schools also provide some insights into the acceptability of the program concept and the materials themselves.

The available information clearly points to a high degree of acceptability of the program. The length is not considered excessive, the materials cover learning objectives

(e.g., reading, math) other than just safety and the loading on the teacher is not unreasonable. If the logistics of acquiring and distributing the program are manageable, there is every reason to believe that it will be well accepted by the groups needed to implement it in elementary schools.

C. MARKETING AND DISTRIBUTION

Ultimately, even the most productive and acceptable program aimed at schools can languish if it is not effectively distributed. Given the large numbers of elementary schools in the United States and the varying methods they use for acquiring materials of this type, distribution requires an organization highly skilled in fulfillment operations. Such an organization should also have a high degree of credibility with elementary school educators.

The existence and content of the curriculum was discussed at various national meetings by members of the project staff and NHTSA. Considerable interest in distributing the materials was generated as a result of these discussions. Ultimately, the National Safety Council (NSC) volunteered to become the distributor of the program. NHTSA and NSC worked together to define a cooperative distribution strategy which involved several steps. First, the text and graphics of the program were turned over to a graphics arts firm for the transition from test to final version. This impacted only the appearance and packaging of the course, not its content. Second, the digital masters of the videos were sent to NSC for duplication and stocking. Third, NSC's marketing department developed the name *Walk-Ride-Walk: Getting to School Safely* for the program and adapted the promotional materials prepared by this project. NSC stock numbers were also assigned to the program as a whole and to each of its individual components. This will permit a school system to order any number of copies of the various items or a complete "kit" from which they can duplicate items to meet their own needs. Finally, as this report is being written, NSC is embarking on a nationwide promotional effort which will encompass professional meetings, catalog entries and personal presentations.

Overall, then, it is fair to conclude that the design objectives of the school bus pedestrian safety program were achieved. It produced changes in target knowledge and behavior, appears readily acceptable to educators and has already started into national distribution.

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APPENDIX A

COURSE BEHAVIORS

GETTING READY FOR SCHOOL

- Place all materials you are taking to school in your backpack
- Keep the backpack closed until you reach school (or home on the return trip)
- Always wear *something* light or bright
- Leave home early enough so that you will be at the bus stop well before the bus is due

WALKING TO/FROM THE BUS STOP

- General rules
 - Walk, don't run
 - Use the same route each day
 - Walk with friends (there is safety in numbers)
 - Do not talk to strangers
 - *Never* accept a ride from *anyone*
 - Don't play along the way
 - Don't litter
 - Don't let pets or small children go with you to the bus stop
 - After school, go straight home
- Walking along the road
 - Stay on the sidewalk if one is available
 - If there is no sidewalk, stay out of the actual road if at all possible
 - If you must walk in the roadway:
 - Face traffic
 - Stay as close to the edge of the roadway as possible
 - Walk single file
 - Watch for weaving cars
 - Be aware of possible dangers--blind curve, brow of hill, narrow road, breaks in road surface, a vehicle passing another vehicle, road without shoulder, wide road
- Knowing your left from your right

- Crossing the road--midblock
 - Go to the edge of the road and stop
 - Look left-right-left
 - When all is clear, cross the street looking left and right until you are safely on the other side
 - Cross only where you have a clear view in both directions--don't cross near the top of a hill or at bad curves in the road

- If there is a parked car in the roadway
 - Go to the edge of the road and stop
 - Look for a driver in the vehicle (make eye contact)
 - Listen for engine noise
 - Look for backup lights
 - If the car is not about to move, walk to the far side of the car, stop and look left-right-left
 - When all is clear, cross the street looking left and right until you are safely on the other side

- If a car stops to let you cross:
 - Wait until all cars have stopped before entering the street
 - Walk to the far side of the stopped car and look left-right-left
 - When all is clear, cross the street looking left and right until you are safely on the other side

- If you cannot see the roadway clearly because of a parked car, tree, mailbox, bush or any other object, walk to the *edge* of the object and look left-right-left before entering the roadway

- Intersections
 - Pedestrian walk signals
 - If the signal says DON'T WALK, do *not* cross the street.
 - If the DON'T WALK signal flashes, don't *start* to cross the street. However, if you have already started to cross, continue to the other side at your normal walking pace.

- When the light is green or the signal says WALK:
 - Go to the edge of the roadway or parked car and stop
 - Look left-right-left for oncoming cars
 - Look over your left or right shoulder, as necessary, for cars making turns--look for the turn signal
 - Look straight through the intersection for vehicles making turns; look for the turn signal
 - When all is clear, cross the street looking left and right (and in front and behind) until you are safely on the other side

- Crosswalks
 - At a crosswalk, always look first to make sure it's safe to cross
 - Go to the edge of the road and look left-right-left for oncoming cars--at an intersection, check also for turning cars
 - When all is clear, cross the street looking left and right until you are safely on the other side

- Driveways and alleys
 - Stop, look and listen for cars before you cross a driveway or alley

WAITING AT THE BUS STOP

- Rules for waiting for the bus
 - Stand at least 6 feet from the road
 - In bad weather, stay way back from the road and watch for skidding cars, buses, trucks
 - Don't talk to strangers or go with *anyone*
 - Don't play running games or push, shove or chase

CROSSING TO THE BUS

- If you must wait on one side of the street and the bus stops on the other side
 - Wait until the bus has come to a complete stop
 - Be sure the red lights are flashing
 - Be sure the swing (STOP) arm is out
 - If available, make sure the crossing arm is out
 - Make eye contact with the bus driver

- Wait for the driver to signal that it is O.K. to cross
- Go to the edge of the roadway and look left-right-left
- When no vehicles are coming (or all vehicles have stopped), cross the street looking left and right until you are safely on the other side
- Cross at least 10 feet in front of the bus where you can see the driver and the driver can see you
- When you get to the other side, walk at least 6 feet beyond the edge of the bus, then turn and walk single file toward the bus for boarding
- If you drop something near the bus, don't stop to pick it up. Tell the driver when you get on the bus and ask the driver to help you.

BOARDING THE BUS

- Rules for boarding
 - Always stay at least 6 feet from the bus until it comes to a complete halt, the door is open and the bus driver says it is O.K. to enter
 - Line up single file
 - If you drop something, don't try to retrieve it; instead, tell the bus driver and follow the driver's directions
 - *Never* reach under the bus
 - Use the handrail to board the bus
 - Be extra careful in bad weather--the steps may be slippery
 - Let small children board first
 - Let children on crutches board before you do and help them store their crutches out of the aisle

RIDING THE BUS

- Rules for safe riding:
 - Greet your driver with a smile
 - Take your seat quickly and face front
 - Talk quietly
 - Do not eat or drink anything on the bus
 - Remain in your seat for the entire ride
 - Keep your head, arms, feet and all belongings inside the bus (*never* out the window)
 - Keep all your belongings in your backpack
 - Keep your backpack in your lap or under the seat
 - Keep aisles clear at all times
 - Do not throw objects inside the bus or out the windows or doors

- Never bring pets, guests, or large, glass or sharp objects on the bus
- Don't kneel or stand on the seats
- Ask the bus driver's permission to open the window
- Obey the driver at all times--the driver is the leader of the safety team
- Don't bother the driver unless someone is feeling ill or there are strange noises or smells

EXITING/CROSSING FROM THE BUS

- Rules for exiting:
 - Remain in your seat until the bus stops
 - Don't get off the bus at other than your regular stop unless you have proper permission
 - When directed by the driver, leave the bus in an orderly fashion
 - When exiting at school, stand only when seats in front of you are empty
 - Use the handrail when you walk down the steps
 - Check that no cars are coming from the right before you step off the bus
 - Move 6 feet directly away from the bus; never walk next to the bus
 - If you drop something near the bus, don't attempt to get it; tell the driver and follow the driver's directions
 - *Never* go near the bus when it is moving--wait until the bus is gone and there is no traffic before you try to pick something up
 - *Never* reach under the bus
 - When arriving at school, go directly into the school building if possible (or follow other school procedure)
 - When departing from school, go directly home

- If you must cross the street:
 - Move 6 feet away from the bus
 - Move 10 feet forward of the front of the bus or until you make eye contact with the driver
 - Wait until the bus driver signals that it is safe to cross
 - Walk to the far edge of the bus, stop and look left-right-left
 - When it is safe, cross the street looking left and right until you are safely on the other side
 - *Never* cross behind the bus

EVACUATING THE BUS

- Procedures for making an emergency exit
 - Remain in your seat until told to do otherwise by the driver
 - Keep calm and quiet and listen for directions
 - Go to the emergency exit when you are told
 - Don't take anything with you
 - Do not push; those closest to the exit go first

- Location and use of emergency exits/equipment
 - Locate and open emergency exits
 - Locate and use emergency equipment

- Exiting through the rear door
 - Hold loose clothing close to body
 - Sit down in doorway or stoop down as low as possible
 - Grasp helper's hand (if available)
 - Drop or jump to ground--land with knees bent
 - Watch for traffic when you leave the bus
 - Move to a safe place away from the bus and stay in a group

- Exiting through the front door
 - Hold the handrail as you go down the steps
 - Watch for traffic when you leave the bus
 - Move to a safe place away from the bus and stay in a group

- If the driver is incapacitated and an emergency situation (smoke, fire, etc.) exists, leave the bus by any available exit as rapidly as possible.

- If the driver is incapacitated and no emergency situation exists:
 - Turn off the ignition
 - Set the parking brake
 - Open front door (or rear door if the front door won't open)
 - Blow the horn to get the attention of people outside the bus
 - Wait for adult help

APPENDIX B

NON-NHTSA SCHOOL BUS PEDESTRIAN MATERIALS

Non-NHTSA materials reviewed by the project are described in the following paragraphs. Included is the source (state, county, city, individual, organization) providing the materials, the grade levels for which the materials were developed, the nature of the materials provided, and a brief outline of contents.

The ABC's of School Bus Safety

Source: States of Iowa, Connecticut, Florida

Grades: K-4

Materials: The curriculum materials provide 10 lesson plans for both K-2 and 3-4 grades with work sheets and suggested activities, a poster, and a video with script and discussion questions. The video is prepared in 10 short (2-3 minute) segments, and one segment is designed to be used with each lesson. The video can be shown first, followed by a discussion of the video contents and performance of other class activities related to the subject matter. Each lesson concludes with a review session--also provided on the video. It is suggested that the teacher spend 15 minutes per lesson, for a total time of approximately 2-1/2 hours. The Connecticut program also includes the following materials from the New York program: teacher questions, student activities, resources (films, videos, filmstrips) and student handouts.

Lessons: The lessons cover the following topics:

1. Waiting for the bus
2. Approaching the bus
3. Boarding the bus
4. Behaving on the bus
5. Emergency exits
6. Teaching cars what to do
7. Leaving the bus
8. Bus departure
9. Dropping and retrieving papers
10. Graduation day/review

Pupil Transportation Safety

Source: States of New York and New Hampshire

Grades: K-6

Materials: This curriculum contains two separate sets of lesson plans--one for K-3 (12 lessons) and one for 4-6 (9 lessons). Included are work sheets, games, resources (films, videos, filmstrips), laws, teacher questions and student handouts.

The program is designed to be given throughout the year and provides for reinforcement of information taught in previous lessons.

Contents: The lessons cover the following topics:

- | | | |
|-------------|-------------------|---|
| Grades K-3: | Unit I (fall) | <ol style="list-style-type: none">1. Emergency evacuation drill2. Danger zones/crossing procedures3. Arriving and waiting, inclement weather4. Boarding, exiting, riding |
| | Unit II (winter) | <ol style="list-style-type: none">1. Emergency evacuation drill2. Safety team3. Riding behaviors, seat belts4. Danger zones, crossing, strangers |
| | Unit III (spring) | <ol style="list-style-type: none">1. Emergency evacuation drill2. Danger zones, crossing, arriving, waiting, boarding (review)3. Safety team, riding behaviors4. General review, vacation safety |
| Grades 4-6: | Unit I (fall) | <ol style="list-style-type: none">1. Bus emergency evacuation drill2. Danger zones, crossing procedures3. Riding behaviors, school bus safety team |
| | Unit II (winter) | <ol style="list-style-type: none">1. Bus emergency evacuation drill, inclement weather2. Arriving, waiting, boarding, exiting3. Riding behaviors, seat belts, safety team |
| | Unit III (spring) | <ol style="list-style-type: none">1. Bus emergency evacuation drill, helping others2. Danger zones, crossing procedures review3. General review, vacation safety |

Pupil Rider Safety

Source: State of Virginia (copyrighted)

Grades: K-3

Materials: The program provides seven packets of lesson plans and work sheets, a parent brochure on motorist responsibilities, a parent brochure showing the danger zone and listing safety rules, available audiovisuals, and an ABC safety reading book for grade 1 with a discussion guide and poster. It is suggested that 15 to 60 minutes be spent per lesson.

Lessons: The lessons cover the following topics:

1. Introduction to pupil rider safety--general safety rules
2. Going to the bus stop
3. Waiting for the bus
4. Danger zone
5. Getting on and off the bus
6. Riding on the bus
7. Emergency evacuation

School Bus Safety

Source: Fairfax County, Virginia (copyrighted)

Grades: K-6

Materials: Two lessons are provided for each grade (spring and fall) with activities and handouts. Specific films and videos are recommended but were not available for review. The first grade ABC reading book is the same as that used by the State of Virginia (see above). Included are ideas for incorporating materials into different subject areas. A parent workbook includes puzzles to be completed with the child.

Contents: The following list of topics may not provide a good description of the program because there are several recommended films, videos and/or filmstrips with each lesson that were not available for review.

- | | |
|--------------------|--|
| K--fall: | Basic safety rules of the bus rider |
| K--spring: | Review of above |
| 1st grade--fall: | Safety rules, danger zone |
| 1st grade--spring: | ABC safety book |
| 2nd grade--fall: | Reasons for proper behavior on the bus |
| 2nd grade--spring: | Delivery and pick-up points for bus and car riders |

3rd grade--fall:	Emergency evacuation
3rd grade--spring:	Making and playing a board game--bus going to school
4th grade--fall:	Conduct on the bus and decision making
4th grade--spring:	Design a school bus of the future
5th grade--fall:	Respect for bus driver's concerns
5th grade--spring:	Using "point of view" to develop a sense of responsibility
6th grade--fall:	Being a role model for good bus rider behavior
6th grade--spring:	Danger zones

The Indiana K-6 Traffic Safety Education Curriculum

Source: State of Indiana

Grades: K-6

Materials: In this program (produced in 1975), lesson plans are provided for three grade levels--K-1, 2-3, and 4-6. There are four sections for each level--pedestrian safety, bicycle safety, auto passenger safety, and school bus safety. Resources (films, written materials) are included, and ideas for incorporating materials into different subject areas are provided.

Contents: Pedestrian and school bus lesson contents for K-1 are as follows:

K-1 Pedestrian	Auditory differentiation Visual perception Distance - space - time Pedestrian behavior: stop, look L-R-L, shapes and meanings of traffic signs
K-1 School bus	Before the bus comes Entering and exiting Expected bus behavior

Lesson contents for grades 2-3 and 4-6 are similar. The pedestrian components are not oriented toward accident types. Rather, they emphasize the basic principles of looking left-right-left, principles of visual and auditory perception, and judging time and distance.

A Safe Ride to School. A Safe Ride Home.

Source: State of Illinois

Grades: Not stated

Materials: A student booklet which also contains advice for a parent/guardian.

Contents: The booklet contains rules for getting to the bus, waiting for the bus, boarding the bus, riding the bus, exiting the bus, crossing the road, and using the emergency exit.

The Oregon Pedestrian and School Bus Safety Book

Source: State of Oregon (copyrighted)

Grades: Not stated

Materials: A student booklet

Contents: The booklet contains information on the danger zone, getting ready, going to the bus stop, waiting at the bus stop, getting on the bus, crossing streets, emergency evacuation, and taking field trips.

A Resource File for Elementary Safety Education in Utah Schools

Source: State of Utah

Grades: K-3

Materials: This curriculum (produced in 1978) contains 33 lessons on pedestrian safety only, including resources and work sheets.

Contents: Included are lessons on traffic signals and signs, need to stop-look-listen before entering the street, where to cross the street, obeying police and safety patrols, definition of central vision and obstructions to vision (e.g., umbrellas), determining the safest route to school.

School Transportation Awareness & Ridership Training

Source: National School Transportation Association

Grades: Not stated

Materials: This curriculum consists of 8 lessons including work sheets plus a National School Bus Safety Week activity booklet. Selected media are suggested. Suggested time for each lesson is 15 minutes to one hour.

Contents: The lessons cover the following topics:

1. What is safety?
2. Going to the bus stop
3. At the bus stop
4. Boarding the bus
5. Behavior on the bus
6. Exiting the bus
7. Field trips and excursions
8. Accident preparedness and emergency evacuations

My School Bus

Source: State of Washington (Note: Produced by the Indiana State Police and reproduced with permission)

Grades: Not stated

Materials: Video and discussion guide.

Contents: Materials cover the following topics: waiting for the bus, crossing to the bus, boarding the bus, the danger zone, behaving on the bus, leaving the bus, bus departure, dropping and retrieving papers, emergency exits and school bus evacuation plans.

Ready to Ride

Source: State of Washington (Lake Washington School District)

Grades: Not stated

Materials: Video

Contents: The video covers the following topics: waiting at the bus stop, crossing to the bus, boarding the bus, riding the bus, danger zones, exiting and crossing from the bus.

Your Bus and You

Source: State of Washington

Grades: K-1

Materials: Filmstrip, audiotape and teacher's guide

Contents: The materials provide rules for waiting at the bus stop, crossing to the bus, boarding and riding the bus, and getting off the bus and going home.

School Bus--The Danger Zone and Things That Help Keep You Safe

Source: State of Washington

Grades: Not stated

Materials: Brochures

Contents: The school bus brochure describes the danger zone and provides tips for getting on and off the bus as well as riding the bus. Also included are general pedestrian safety rules. The safety brochure has recommendations for motorcyclists, car passengers and school bus riders. School bus safety rules are included.

School Bus Safety Program

Source: American Automobile Association

Grades: Primary

Materials: A teacher packet contains bus safety rules and work sheets, a danger zone poster, safety tips for parents, information on school bus patrols, and a teacher's guide to the safest route to school.

Contents: The packet contains information on being on time, waiting at the bus stop, boarding the bus, riding the bus, crossing the street in front of the bus, obeying the school bus patrol, staying out of the danger zone, and obeying the bus driver.

It's Worth A Life

Source: M. Roscoe (President of National Association for Pupil Transportation--The program was developed and formerly used by him in Wetzel County, Virginia)

Grades: K-12

Materials: A curriculum with lesson plans for each grade including activities, discussion questions, work sheets and resources.

Contents: Topic coverage includes: walking to the bus, waiting for the bus, boarding the bus, riding the bus, exiting the bus and crossing the street, danger zones, proper care of the bus, and evacuating the bus.

Safe Crossing: An "Egg-cellent" Idea

Source: Quality Safety Services (New York) (Produced by Cayuga-Onondaga BOCES in cooperation with New York State Board of Education--partial funding by NHTSA)

Grades: K-3

Materials: Video

Contents: The video tells the story of a boy who is taking a dinosaur to school for "Show and Tell." It covers waiting for the bus, boarding the bus, riding the bus, danger zones, exiting the bus and crossing the street.

Look Out

Source: Allegheny County, Pennsylvania

Grades: Elementary

Materials: Video and discussion guide

Contents: This rap-style video contains safety suggestions for pedestrians, school bus riders, car passengers and bicyclists. Pedestrian topics include the importance of looking before crossing, car stopping distances, crossing in the presence of parked or stopped cars, a caution that the crosswalk doesn't mean it's safe to cross, advice to look for turning vehicles, recommendations to walk home from school using the same route each day, and procedures for walking in the roadway. School bus topics include exiting and crossing in front of the bus, the danger zone, and procedures to follow when the bus rider drops things near the bus.

Bus Safety for Students

Source: Washoe County, Nevada

Grades: Not stated

Materials: Demonstration tape prepared for bus drivers who give school bus safety training to students.

Contents: The tape starts with a film that reenacts a school bus accident that occurred in New Smyrna, Delaware, to a child named Angel. The child was hit by a school bus while trying to retrieve some dropped papers. It then shows two school bus drivers discussing the film and presenting a slide series--one to a group of 3rd graders and one to a group of 1st graders. The following topics are covered: the danger, death and safe zones around a school bus, the driver's vision around the bus (including mirrors), and safe riding procedures.

Talking Safety Bus

Source: Digital Recorders, Inc.

Grades: Not stated

Materials: Promotional video

Contents: This video promotes an automated announcing system for school buses. The system is turned on and off by the driver. It contains safety messages for boarding and exiting the bus. A railroad crossing safety message is also available.

Urban School Bus Safety

Source: Milwaukee, Wisconsin (produced by Milwaukee high school students)

Grades: Elementary

Materials: Video

Contents: This rap video includes advice on walking to the bus, waiting for the bus, boarding the bus, the danger zone, riding the bus, and exiting the bus in an urban environment.

APPENDIX C

SELECTED CRASH DATA

This appendix presents crash data received by the project and not included in the main body of the report. It includes selected data from FARS and GES as well as data provided by some states.

FARS Data

The FARS data for 1990 showed the location of fatal crashes involving pedestrians aged 5 through 15 (four years older than the maximum student age expected for this study) as follows:

	<u>Percent of crashes</u>	
	<u>Age 5-9</u>	<u>Age 10-15</u>
Intersection	21.0%	18.1%
Non-intersection	78.7	81.5
Unknown	0.3	0.4
Sample size (N)	(362)	(281)

GES Data

The GES 1990 data also provided estimates of crash location by age group. The age groups were somewhat different from those presented in the FARS data--the first group included *all* ages up to 9, and the second group ended at age 14. The GES estimates of injured and killed pedestrians for 1990 were as follows:

	<u>Percent of crashes</u>	
	<u>Age 9 and under</u>	<u>Age 10-14</u>
Intersection	21%	36%
Non-intersection	79	64

The GES estimates for the two age groups distributed by the nine broad MAT categories are shown on the following page.

	<u>Percent of crashes</u>	
	<u>1990</u>	<u>1991</u>
Bus, ice cream vendor, mail box	8.93%	6.46%
Driverless & backing vehicles	0.60	0.48
Disabled & emergency vehicles	--	--
Working & playing in roadway	3.05	1.74
Walking in road	0.82	0.94
Pedestrian not in roadway	4.49	2.22
Intersection accidents	33.26	34.13
Midblock accidents	45.57	52.50
Inadequate information	3.26	1.53

Selected State Crash Data

The *State of California* provided an annual report of fatal and injury motor vehicle crashes for 1991. It included an indication of the activity of pedestrians by age group. The activities for 4,441 accidents involving 5-14 year olds (a group that includes slightly older pedestrians than the study target group), were as follows:

	<u>Percent of crashes</u>
Crossing in crosswalk at intersection	26.9%
Crossing in crosswalk not at intersection	2.1
Crossing not in crosswalk	56.9
In roadway (including shoulder)	10.3
Not in roadway	3.5
Approaching/leaving school bus	.2
No information	.1

The *State of Connecticut* provided data on 21 school-bus related fatalities that occurred over the last 20 years to children who were 12 years old or less. Crashes included both school bus passengers and non-passengers, as follows:

Passengers:

Struck by front of bus after exiting	=	7
Struck by rear of bus after exiting	=	2
Struck by passing motorist after exiting	=	1
Struck by bus while running to catch bus	=	2

Non-passengers:

Struck by bus while running in front of it	=	5
Ran into side of bus	=	1
Ran and fell under bus	=	1
Cycled in front of bus	=	2

The ages of the fatalities were as follows:

4 years and under	=	3
5 years	=	4
6 years	=	5
7 years	=	3
8 years	=	1
9 years	=	1
10 years	=	-
11 years	=	2
12 years	=	2

In terms of student grade level, the list shows that 76.2% of the fatalities occurred at the third grade level or less.

The fatalities occurred in the following areas:

Loading/unloading area	=	15
School grounds	=	1
Road, street, highway	=	5

In terms of school-home direction of travel, the fatalities occurred as follows:

School-bound	=	2
Home-bound	=	14
Unknown	=	5

The majority of school bus injury crashes in Connecticut occurred when the children were on their way home from school.

The *State of Oregon* reported 116 student school bus injury crashes for the years 1986 to 1992. Conditions in which crashes occurred were as follows:

Percent of accidents

Bus collision (another vehicle, train, etc.)	69.0%
Bus ran off road, upset, etc.	9.5
Starts, stops, slips, falls	9.5
Approaching/leaving bus	1.7
Hit by other vehicle while coming to/leaving bus	10.3

The *State of Michigan* reported 13 fatalities for the years 1988 to 1990. In 73% of the cases, they occurred while the pedestrian was crossing in front of the bus. In terms of grade level, they were distributed as follows:

Kindergarten through 2nd grade	=	9
3rd through 6th grade	=	2
7th grade plus	=	2

APPENDIX D

BEHAVIORAL OBSERVATIONS: DATA COLLECTION PROCEDURES AND FORMS

1. Exiting the Bus and Crossing the Street

Children were brought to the front of the school building one class at a time and were given the following instructions by the substitute teacher:

Today we are going to pretend we are riding the school bus home from school at the end of the day. I will let each of you know when you have reached your bus stop and it is time to get off. You will then show us how you would safely leave the bus, cross the street and go home. Now first, I will need to show you where home is.

The substitute teacher then took the class as a group to the plastic barrel and gave the following instructions:

When I tell you to go home, I want you to leave the bus, cross this street (pointed to driveway), come to this spot and touch this object and then you should go to your teacher [gave teacher's name] at [gave place agreed to with teacher]. Does everyone know where home is? O.K., now we are going to board the bus.

As the substitute teacher took the class across the driveway to the bus, the following comment was made:

Now, remember, when you get off the bus, this is going to be the street you will cross to go home.

All children then boarded the bus. The children were directed to sit on the right side of the bus (opposite the school) so that they would not be able to see their classmates cross the driveway from the bus. When all children were seated, the following instructions were given:

Now you are riding home on the school bus at the end of the day. When I point to you and tell you to go home, the bus has arrived at your bus stop. Then you will show us how you would safely leave the bus, cross the street and touch "home." Then you should join your teacher at [designated place].

Then one child at a time was directed to leave the bus and go home. The substitute teacher gave each child the following instructions until all children had left the bus and were inside the school:

We have arrived at your bus stop. Please go home.

A trained observer (stationed outside the bus) notified the substitute teacher by a prearranged hand signal when a child should be directed to leave the bus and recorded the following behaviors on a prepared form which appears in Figure 4:

- *Hold handrail:* Enter Y (yes) or N (no) for whether or not the child used the handrail when exiting the bus.
- *Look right before exiting:* Enter Y (yes) or N (no) for whether or not the child looked to the right before exiting.
- *Move ___ feet from side of bus:* Enter the number of feet the child moved away from the side of the bus.
- *Move ___ feet forward of bus:* Enter the number of feet the child moved forward of the bus. (Note: Enter "B" if the child crossed the street behind the bus.)
- *Wait for driver signal:* Enter Y (yes) or N (no) to indicate whether or not the child waited for the driver's signal before crossing.
- *Stop at edge of bus:* Enter F, P or N to indicate if the child stopped at the edge of the bus, as follows:
 - F = Full stop
 - P = Partial stop
 - N = No stop
- *Search while stopped:* Enter R (right) and/or L (left) to indicate directions (if any) in which the child searched before crossing. Enter N if the child made no search before crossing.
- *Search while crossing:* Enter R (right) and/or L (left) to indicate directions in which the child searched while crossing. Enter N if the child made no search while crossing.
- *Arrive ___ feet forward of bus:* Enter the number of feet forward of the bus that the child arrived on the other side of the driveway. Use negative numbers to indicate that the child did not arrive forward of the bus.

Tape placed at inconspicuous points along the driveway permitted the observer to make accurate judgments of distances.

2. Waiting for and Boarding the Bus

The observers recorded their data on a prepared form (see Figure 5) using the following instructions:

Waiting behavior

- *Form of waiting:* Enter L, C or S (in a line, in a clump, or scattered) for the form in which the *boarding* children (not adults) are waiting. If there is only one child waiting, enter NA.
- *Stand ___ feet from street:* Enter the distance in feet from the curb that the *boarding* children are standing.
- *Available space:* Enter the depth of the available waiting space. For example, if the children are standing 3 feet from the curb and there are 6 feet available, enter 6. If 10 feet or more are available, enter 10+.

Note: The remainder of the form was completed *only* for the *first* child to *board* the bus. If there were same as well as opposite side boarders, the form was completed for the first *opposite side child to cross the street*.

Same side boarding

- *Move:* Enter B, S, O, or H to indicate when the first child in the group moved toward the bus as follows:
 - B = child moved before the bus stopped
 - S = child moved when the bus stopped
 - O = child moved when the door opened
 - H = child appeared to hesitate/wait for a driver signal
- *Use handrail:* Enter Y (yes) or N (no) to indicate whether or not the child used the handrail when boarding.
- *Go to Child's grade.*

Opposite side boarding

- *Look for signal:* Enter Y (yes) or N (no) to indicate whether or not the first child to cross the street appeared to look for driver's signal.
- *Stop at curb:* Enter Y (yes) or N (no) to indicate whether or not the child stopped at the curb.
- *Look for cars:* Enter R (right) and/or L (left) to indicate directions (if any) in which the child looked before crossing. For example, if child looked left-right-left, enter L-R-L.
- *Look while crossing:* Enter as above to indicate directions in which the child looked while crossing.
- *Walk ___ feet from front:* Enter number of feet the child walked in front of the bus.
- *Walk ___ feet from side:* Enter number of feet the child walked from the side of the bus.
- *Use handrail:* Enter Y (yes) or N (no) to indicate whether or not the child used the handrail when boarding.

Child's grade: As the child is boarding, ask for the child's grade and enter K, 1, 2, 3, 4, 5 or 6, as appropriate.